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A-6001-401 (12/00)

DOE/RL-2003-24
Draft A

Proposed Plan for the U Plant Closure Area Waste Sites

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

United States
Department of Energy
P.O. Box 550
Richland, Washington 99352

Project Hanford Management Contractor for the
U.S. Department of Energy under Contract DE-AC06-96RL13200

Approved for Public Release
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Further Dissemination Unlimited

DOE/RL-2003-24
Draft A

Proposed Plan for the U Plant Closure Area Waste Sites

R.L. Jackson, Fluor Hanford, Inc.

June 2003

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

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Department of Energy
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Richland, Washington 99352

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PROPOSED PLAN FOR THE U PLANT CLOSURE AREA WASTE SITES

Hanford Site, Richland, Washington

EPA, ECOLOGY, AND DOE ANNOUNCE PROPOSED PLAN

This **Proposed Plan**[1] identifies the preferred alternatives for remedial action and provides the rationale for the proposed selection for Hanford Site U Plant Closure Area waste sites. Summaries of the other cleanup alternatives that were evaluated for the waste sites are provided. This document also identifies the closure strategy for the 216-U-12 Crib ***Resource Conservation and Recovery Act of 1976*** (RCRA) **treatment, storage, and disposal** (TSD) unit. As identified in the *Focused Feasibility Study for the U Plant Closure Area Waste Sites* (DOE/RL-2003-23) (focused feasibility study [FFS]), the closure of the TSD is incorporated into the ***Comprehensive Environmental Response, Compensation, and Liability Act of 1980*** (CERCLA) (also known as "Superfund") documentation. The remaining waste sites in the U Plant Closure Area are either RCRA past-practice waste sites, which will undergo RCRA corrective action, or CERCLA past-practice waste site, which will undergo remediation under CERCLA. Both RCRA and CERCLA past-practice site evaluations use the CERCLA remedial investigation/feasibility study (RI/FS) process to identify preferred remedial actions.

This document is issued by the U.S. Environmental Protection Agency (EPA), the Washington State Department of Ecology (Ecology), and the U.S. Department of Energy (DOE). The three agencies, collectively known as the Tri-Parties, are proposing the preferred alternatives for these waste sites under the authority of CERCLA and the RCRA closure and corrective action authorities, and in accordance with the ***Hanford Federal Facility Agreement and Consent Order*** (Tri-Party Agreement). The DOE is also issuing this Proposed Plan as part of its responsibility under the ***National Environmental Policy Act of 1969*** (NEPA).

The Tri-Parties are issuing this document as part of the public participation responsibilities under Section 117(a) of CERCLA. Final remedies will be selected only after the public comment period has ended and the comments received have been reviewed and considered. Therefore, the public is encouraged to review and comment on all of the alternatives presented in this document.

If requested, a public meeting will be held to explain the content of this Proposed Plan. Responses to comments will be presented in a responsiveness summary that will be part of the **Record of Decision** (ROD). Dates for the public review period are specified in the box below.

This document highlights key information that can be found in greater detail in the FFS (DOE/RL-2003-23) and other documents contained in the **Administrative Record** file for these operable units (OU). These documents may be reviewed to gain a more comprehensive understanding of the history, previous studies, site descriptions, and **remedial alternatives** considered for these waste sites.

MARK YOUR CALENDAR

Public Comment Period: TBD

The Tri-Parties will accept written comments on the Proposed Plan at any time during the 30-day public comment period. Please send written comments to:

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[1] Technical terms and other text in bold are defined in the glossary at the end of this document.

Public Meeting: Members of the public may request a meeting to provide oral comments or for an explanation of the remedial alternatives presented in the Proposed Plan by contacting John Price. To provide adequate notice for all Hanford stakeholders, public meeting requests should be received by TBD

For more information, please consult the Administrative Record in the locations specified at the end of this document.

OVERVIEW

The U Plant Closure Area waste sites is a source control cleanup action that addresses contaminated soil and structures (e.g., tanks, pipe) associated with cribs, trenches, French drains, debris piles, septic systems, and unplanned releases. Other than the requirement for the source control action to be protective of groundwater and surface water, the scope does not include remediation of groundwater that may be beneath these waste sites. Contaminated groundwater in the U Plant Closure Area currently is being and will continue to be addressed under the 200-UP-1 Groundwater OU.

Risks were estimated based on information from a series of risk framework workshops. The Tri-Parties recently undertook the task of developing a risk framework to support risk assessments in the Central Plateau. The workshops included representatives from DOE, EPA, Ecology, the Hanford Advisory Board (HAB), the Tribal Nations, the State of Oregon, and other interested stakeholders. The workshops focused on the different programs involved in activities in the Central Plateau and the need for a consistent application of risk assessment assumptions and goals. The results of the risk framework are documented in HAB advice #132, "Exposure Scenarios Task Force on the 200 Area"; in the Tri-Parties response to the HAB advice (Klein et al. 2002, "Consensus Advice #132: Exposure Scenarios Task Force on the 200 Area"); and in the *Report of the Exposure Scenarios Task Force* (HAB 2002). Based on the risk framework workshops, waste sites within the core zone will be evaluated using an industrial (exclusive) exposure scenario. Groundwater under the core zone will not be used while contaminated.

The preferred alternatives proposed by the Tri-Parties include a range of responses based on the individual characteristics of the waste sites; the alternatives are aimed at reducing risks at the waste sites to support risk-based decisions. The preferred alternatives include:

- No Action, for waste sites that have not received waste or that currently meet preliminary remediation goals (PRG); these sites do not pose an unacceptable risk to human or ecological receptors
- Maintain Existing Soil Cover, Institutional Controls and Monitored Natural Attenuation for waste sites that have existing clean-fill soil covers and that reach remediation goals within about 150 years; this alternative addresses risk by breaking the pathway between receptors and contaminants
- Capping, for sites with human health and/or ecological risks and for groundwater protection; this alternative also addresses risk by breaking the pathway between receptors and contaminants
- Remove and Dispose of contaminated soil and debris to protect human and ecological receptors and/or groundwater. Contaminated soils and debris will be disposed of at an onsite facility, such as the Environmental Restoration Disposal Facility (ERDF) in the Central Plateau of the Hanford Site. Risks are reduced by the removal of contaminants from the environment and disposal to a more secure facility.

A major element of the preferred alternatives is the use of institutional controls and natural attenuation. Implementation of institutional controls is an integral part of the maintain existing soil cover, institutional controls, and monitored natural attenuation alternative; the capping alternative; and possibly the remove and dispose alternative, because some contaminants could be left on site. Institutional controls consist of methods to preclude unintentional trespassing (e.g., signs, access control, excavation permits) and legal restrictions on the use of land and groundwater. Integration of waste site characterization data gathered during implementation of the source control action, coupled with ongoing groundwater monitoring and barrier performance programs, is also an important element of the cleanup remedy. As presented in subsequent sections of this document, groundwater monitoring program requirements and final groundwater cleanup decisions will be made as part of the 200-UP-1 OUs.

The combined present-value cost for implementation of the preferred alternatives at the

waste sites is estimated to be approximately $16 million. Individual present-value costs for each of the waste sites are provided in Appendix A.

Descriptions of the waste sites and all of the alternatives considered are provided in greater detail in the FFS (DOE/RL-2003-23) and throughout the remainder of this document.

SITE BACKGROUND

Hanford Site

The Hanford Site (Figure 1) is a 1,517-km^2 (586-mi^2) Federal facility located in southeastern Washington State along the Columbia River. From 1943 to 1990, the primary mission of the Hanford Site was the production of nuclear materials for national defense. In July 1989, the Hanford Site was placed on the National Priorities List (NPL) (40 CFR 300, Appendix B) pursuant to CERCLA. The Hanford Site currently includes three NPL sites consisting of the 100, 200, and 300 Areas.

200 Areas

The 200 Areas are located in the central portion of the Hanford Site and are divided into three main areas: 200 East Area, 200 West Area, and 200 North Area. Operations in the 200 East and 200 West Areas were related to chemical separation, plutonium and uranium recovery, processing of fission products, and waste partitioning. Major chemical processes in the 200 Areas routed high-activity waste streams to systems of large underground tanks called "tank farms." The liquid wastes were evaporated (concentrated) and often neutralized before being routed to the tanks. The storage tanks were used to allow settling of the heavier constituents from the liquid effluents, forming sludge. The liquid supernatants in the tanks were ultimately discharged to the soil column via cribs, drains, trenches, and injection/reverse wells. Process distillate and drainages were also sent to cribs and trenches via this underground network. Lower activity liquid wastes were discharged to surface impoundments such as trenches, cribs, drains, and ponds. Many of these surface impoundments were unlined. The 200 North Area was formerly used for interim storage and staging of irradiated fuel.

Waste sites within the 200 Areas were organized into 32 geographically based OUs until 1996, when the waste sites were reorganized into 23 waste group OUs based on the type of discharge received and the waste site type (DOE/RL-96-81, *Waste Site Grouping for 200 Areas Soil Investigations*). In February 2002, the Tri-Parties agreed during the Central Plateau negotiations to streamline the 200 Areas vadose zone characterization activities. Thus, 12 OUs were identified for remedial investigations (RI). Data from the RIs at these 12 OUs will support remedial decisions at all the OUs. Other data sources, such as DOE/RL-2001-54, Draft B, *Central Plateau Ecological Evaluation*, annual Hanford Site environmental reports, and other existing data also will be used in the decision-making process.

The U Plant Closure Area, approximately half square mile, consists of the U Plant Canyon Building (221-U Building), associated facilities and ancillary equipment including underground pipeline, and several waste sites (Figure 2). The 221-U Building, associated facilities, and ancillary equipment will be addressed under separate decision-making pathways. The waste sites consist CERCLA past-practice sites, RCRA past-practice sites, and TSDs, all of which are currently assigned to several source OUs. These waste sites consist predominantly of liquid waste disposal sites associated with the 221-U operations and a few solid waste sites such as debris piles and a burial trench. The liquid waste disposal sites include cribs, trenches, french drains, septic systems, unplanned releases, one underground settling tank, and one underground pipeline with significant vadose zone contamination.

Analogous Site Approach

The analogous site approach detailed in the *200 Areas Remedial Investigation/Feasibility Study Implementation Plan – Environmental Restoration Program* (DOE/RL-98-28) (Implementation Plan) streamlines the RI process by focusing activities on representative sites within OUs. The representative sites have geologic, contaminant inventory, effluent volume, contaminant distribution, and structure characteristics that are similar to those of the other sites in the OU or that represent the worst case scenario in the OU, making them a bounding condition for the other, analogous sites. Data are collected from the representative sites; these data are used to support the remedial decision for all the waste sites in an OU. The ROD will address all the waste sites in an OU. However, following issuance of the ROD, additional data may be collected at the waste sites to confirm that the correct alternative was selected and to collect design data for the implementation of the remedial alternative. This strategy results in considerable cost savings, because investigation costs can be delayed until after the ROD when the confirmatory data needs can be streamlined and focused on the best amount and type of data to collect.

For example, if a site is slated for a remove-and-dispose alternative, then only limited data are needed to support the implementation. Much of the data will be collected from the observational approach, where contaminants are removed and samples are taken as the removal progresses to ensure that the remediation goals are met. However, if a capping alternative is selected, then data are needed to confirm the appropriate size of cap needed and to ensure that the contaminant distribution model identified for the representative site accurately depicts the lateral contamination distribution at the analogous site to be capped.

The characterization and remediation of waste sites at the Hanford Site are addressed in the Tri-Party Agreement. In 2002, the Tri-Parties renegotiated the 200 Areas waste site cleanup milestones under the Tri-Party Agreement. As part of these negotiations, the Tri-Parties agreed to address the U Plant Closure Area, incorporating waste sites in various OUs based on the proximity to the 221-U Building. Combining these waste sites in the FFS supports closure of a large geographic area and supports the goal of addressing source terms in the protection of groundwater.

The Tri-Party Agreement also addresses the need for the cleanup programs to integrate the requirements of the CERCLA and RCRA, to provide a standard approach to direct cleanup activities in a consistent manner, and to ensure that applicable regulatory requirements are met. Details of this integration for the 200 Areas are presented in the Implementation Plan. Integration of the RCRA past-practice waste sites, CERCLA past-practice waste sites, and the RCRA TSD unit in the FFS will streamline the evaluation of remedial alternatives and the ultimate remediation of the waste sites while satisfying the requirements of the different regulations governing the sites.

Representative Waste Site Descriptions

The representative sites were initially defined in the Implementation Plan. The FFS further defined the representative sites, adding two additional sites to adequately address the various aspects associated with the U Plant Closure Area waste sites. The representative waste sites are the 216-U-8 Crib, the 216-U-12 Crib, the 216-U-4 Reverse Well / 216-U-4A French Drain, and the UPR-200-W-19 unplanned release.

216-U-8 Crib. The site consists of three wood timber cribs in series at the bottom of a backfilled trench. The bottom of the excavation measures 48 by 15 m (160 by 50 ft). Each timber crib measures 4.9 by 4.9 by 3.0 m deep (16 by 16 by 10 ft). The cribs were filled with crushed stone to the tops of the timber structures. The cribs contain roughly 2,070 m^3 (73,000 ft^3) of gravel fill. The crib was in operation from June 1952 to March 1960. The site was deactivated by blanking the pipeline approximately 18 m (60 ft) north of the unit when ground settling occurred around the crib vent risers. The crib received acidic process condensate from the 221-U and 224-U Buildings along with drainage from the 291-U Stack via an underground 15 cm (6–in.) vitrified clay pipeline (VCP).

Appendix B of this proposed plan provides summary information for the analogous waste sites and provides justification for assignment to a particular representative waste site. Waste sites considered analogous to the 216-U-8 Crib include:

- 216-U-1 and 216-U-2 Cribs
- 241-U-361 Settling Tank
- 200-W-42 Vitrified Clay Pipeline / UPR-200-W-163 unplanned release.

216-U-12 Crib. The 216-U-12 Crib is the RCRA TSD site. The 216-U-12 Crib was built in 1960 to replace the 216-U-8 Crib when it showed signs of cave-in potential. 216-U-12 Crib was operational until 1988, when the pipeline was cut and capped. The crib is approximately 4.6 m (15 ft) deep and contains no structure (other than backfill, vent risers, and VCP). The bottom of the crib measures 30 m (100 ft) long and 3 m (10 ft) wide. The surface dimensions of the crib are 46 m (150 ft) long by 18 m (60 ft) wide. In 1992, the site surface was radiologically surveyed and down posted from a Surface Contamination Area to an Underground Radioactive Material Area. The 216-U-12 Crib was designed to receive mixed waste from the 221-U Building, via a 15 cm (6-in.) VCP, for approximately 5 minutes every hour, at the rate of 378 L/min (100 gal/min), and to dispose of the process condensate by percolation into the soil column (DOE/RL-95-13, *Limited Field Investigation for the 200-UP-2 Operable Unit*).

Waste sites considered analogous to the 216-U-12 Crib include:

- 216-U-5 Trench
- 216-U-6 Trench
- 216-U-15 Trench
- 216-U-16 Crib
- 216-U-17 Crib.

216-U-4 Reverse Well / 216-U-4A French Drain. The 216-U-4 Reverse Well and 216-U-4A French Drain will be discussed as a single representative waste site because of their close proximity to one another and because they received the same waste stream. The 216-U-4 Reverse Well is a deactivated

reverse well. No stabilization cover exists over the 216-U-4 Reverse Well. The well consists of a 7.6-cm (3–in.)-diameter pipe installed 23 m (75 ft) into the ground with the bottom 8 m (25 ft) of pipe perforated. The end of the pipe is nearly closed by flattening. An overflow pipe connects the 216-U-4 Reverse Well with the 216-U-4A French Drain. The french drain consists of a 1.3-m (51-in)-diameter concrete pipe placed vertically in the ground. The pipe extends downward a minimum of 1.2 m (4 ft) and its top is 1.5 m (5 ft) below grade. The pipe is not gravel filled and is covered by a 12.7-cm (5-in)-thick wooden lid. The drain rests on undisturbed soil. The sites received acidic decontamination waste containing fission products from the 222-U Laboratory hood sinks.

Waste sites considered analogous to the 216-U-4 / 216-U-4A Reverse Well and French Drain include the 216-U-4B French Drain.

UPR-200-W-19 unplanned release. The UPR-200-W-19 site is near the 241-U-361 Settling Tank and the 216-U-1 and 216-U-2 Cribs. In the spring of 1953, organic wastes and cell drainage from the tributyl phosphate process in the 221-U Building and waste from the224-U Building (UO_3) overflowed to the ground by way of the 241-U-361 Settling Tank and the 216-U-1 and 216-U-2 Crib vents. Contamination readings of 11.5 rads per hour at a distance of 7.6 cm (3 in.) were reported over an area of approximately 4.6 m^2 (50 ft^2). The area where the release occurred is currently marked as an Underground Radioactive Material Area that also contains the 216-U-1 Crib, 216-U-2 Crib, and the 241-U-361 Settling Tank. A portion of the 2607-W5 Septic System (i.e., the tile field) also is included in the Underground Radioactive Material Area. In 1953, decontamination was attempted and the area was backfilled, delineated by a wooden fence, and posted with Radiation Zone signs. In 1992, contaminated soil in the vicinity of the 216-U-1 and 216-U-2 Cribs was scraped and consolidated near the 241-U-361 Settling Tank. Stabilization actions conducted in 1991 included removing approximately 15 to 30 cm (6 to 12 in.) of soil from the areas. Stabilization cover 46 to 61 cm (18 to 24 in) thick was placed over the areas that were not removed from radiological posting. The area was downposted from a Surface Contamination Area to an Underground Radioactive Material Area.

Waste sites considered to be analogous to the UPR-200-W-19 unplanned release include:

- 2607-W5 Septic System
- 2607-W7 Septic Tank
- 200-W-56 Dump
- 200-W-57 Dump
- 200-W-71 Pit
- UPR-200-W-8 Pit
- UPR-200-W-118 unplanned release
- UPR-200-W-33 unplanned release
- UPR-200-W-48 unplanned release
- UPR-200-W-55 unplanned release
- 200-W-77 unplanned release
- UPR-200-W-78 unplanned release
- 200-W-85 unplanned release
- 200-W-87 unplanned release
- 200-W-89 Foundation
- UPR-200-W-117 / UPR-200-W-60 unplanned releases.

SCOPE AND ROLE OF ACTION

Cleanup of these waste sites is a risk-based, source control action that addresses contaminated soil and structures (e.g., concrete, tanks) associated with solid waste sites and liquid-waste disposal sites such cribs, trenches, french drains, septic systems, unplanned release sites, one underground settling tank, underground pipeline, and septic tanks. Other than the requirement for the source control action to be protective of groundwater and surface water, the scope does not include remediation of groundwater that may be beneath these waste sites. Contaminated groundwater in the 200 West Area is addressed by the 200-UP-1 OU.

Findings of the RI/FS indicate that:

- Radionuclide contaminants associated with the representative waste sites exceed the criteria for the target dose of 15 mrem/year and the target risk level of 1.0 x 10-5
- Nonradionuclide contaminants in and around the representative waste sites are less than the criteria of the *Washington Administrative Code* (WAC) 173-340-745, Method C
- Groundwater protection values are exceeded for nonradionuclides (WAC 173-340-747) and for radionuclides (total dose of 4 mrem/year) at two of the representative waste sites
- Ecological risks are not likely high enough to pose unacceptable risk to terrestrial wildlife populations in the area, with the exception of 200-W-42 Vitrified Clay Pipeline / UPR-200-W-163, where cesium-137 is above the environmental hazard quotient of one.

SUMMARY OF REMEDIATION OBJECTIVES

Human health and ecological risk assessments were performed in accordance with the *Hanford Past-Practice Strategy* (DOE/RL-91-40). This approach limits the preremediation studies (e.g., RIs), so that more resources can be allocated to the cleanup of waste sites. A conceptual site model was developed for the waste sites. Potential risks to human health and ecological receptors were evaluated in risk assessments for the representative sites, as documented in the FFS (DOE/RL-2003-23).

The Tri-Parties believe that the preferred alternatives are necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment. Such a release, or threat of release, may present an imminent and substantial endangerment to public health, welfare, or the environment.

Land Use

The reasonably anticipated future land use for the U Plant Closure Area is continued Industrial-exclusive activities. The DOE worked for several years with cooperating agencies and stakeholders to define land-use goals for the Hanford Site and develop future land-use plans (Drummond et al. 1992). The cooperating agencies and stakeholders included the National Park Service, Tribal Nations, states of Washington and Oregon, local county and city governments, economic and business development interests, environmental groups, and agricultural interests. These efforts culminated in the CLUP-EIS (DOE/EIS-0222-F, *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement*) and the "Record of Decision: Hanford Comprehensive Land-Use Plan Environmental Impact Statement" (64 FR 61615), which were issued in 1999.

According to the CLUP-EIS, industrial (exclusive) land use would preserve DOE control of the continuing remediation activities and would use the existing compatible infrastructure required to support activities such as dangerous waste, radioactive waste, and mixed waste TSD facilities. The DOE and its contractors, and the U.S. Department of Defense and its contractors, could continue their Federal waste disposal missions, and the Northwest Low-Level Radioactive Waste Compact could continue using the U.S. Ecology site for commercial radioactive waste. Research supporting the dangerous waste, radioactive waste, and mixed waste TSD facilities also would be encouraged within this land-use designation. New uses of radioactive materials such as food irradiation could be developed and packaged for commercial distribution here under this land-use designation.

Remedial Action Objectives

Remedial action objectives (RAO) were developed based on the reasonably anticipated future land use, the conceptual site model, applicable or relevant and appropriate requirements (ARAR), and worker safety. The following RAOs were identified for these waste sites:

- **RAO 1** - Prevent or reduce risk to human health, ecological receptors, and natural resources associated with exposure to wastes or soil contaminated above ARARs or risk-based criteria
- **RAO 2** - Prevent migration of contaminants through the soil column to groundwater such that concentrations in groundwater are not predicted to exceed ARARs
- **RAO 3** - Prevent or reduce occupational health risks to workers performing remedial actions
- **RAO 4** - Minimize the general disruption of cultural resources and wildlife habitat and prevent adverse impacts to cultural resources and threatened or endangered species
- **RAO 5** - Provide conditions suitable for future industrial land use of the study area, including appropriate institutional controls and monitoring requirements to protect future users of remediated sites.

The RAOs provide the basis for determining the preliminary remediation goals for evaluation with the waste site contaminants and conceptual model. The RAOs will be finalized in the ROD for the OUs.

Preliminary Remediation Goals

Preliminary remediation goals were developed for a comprehensive list of contaminants of concern (COC) to establish residual soil concentrations for individual contaminants that are protective of human health and the environment at a generic waste site. Following public comment, the PRGs will be issued in the ROD for these waste sites as remediation goals or cleanup levels.

Contaminant-specific cleanup levels may differ for individual waste sites based on site-specific conditions (e.g., size of the waste site, nature and extent of contamination in the soil column) or to achieve the overall RAOs for the waste sites (e.g., cumulative risk from multiple contaminants, protection of groundwater). Changes to contaminant-specific cleanup levels will require advanced approval by the EPA and documentation in the verification/closeout reports for individual waste sites.

Numeric soil PRGs were developed independently for the protection of human health, the protection of ecological receptors, and the protection of groundwater based on generic site parameters and subsequently were compared to each other to identify the most restrictive value and select a PRG that is protective of all pathways. The PRGs are presented in Tables 1 and 2.

Based on historical 200 Areas operations and characterization information, a comprehensive list of potential contaminants was identified for the waste sites. Although PRGs were developed for each of the potential contaminants, it should be emphasized that these contaminants will not necessarily be found at each waste site. Some of the potential contaminants may not be found at any of the waste sites. A complete discussion of the PRGs is presented in the U Plant Closure Area FFS (DOE/RL-2003-23).

SUMMARY OF REMEDIAL ALTERNATIVES

Remedial technologies were identified and evaluated in the FFS (DOE/RL-2003-23) based on their ability to reduce potential risks to human health and the environment from the waste sites. Collective experience gained from previous studies and evaluation of cleanup methods at the Hanford Site were used to identify technologies that would be carried forward as remedial alternatives to address the RAOs. Four remedial alternatives were identified for detailed and comparative analyses.

Common Elements. Other than the No Action alternative, the remaining alternatives have several common elements.

- **Institutional Controls** are an integral component of each remaining alternative. These controls may include restrictions to prevent intrusion or cap integrity-altering activities, environmental monitoring, and/or deed restrictions.
- **Natural Attenuation** is an integral component of each remaining alternative through radioactive decay of constituents such as cesium-137.
- **Monitoring** activities for the U Plant Closure Area waste sites will be integrated into the 200-UP-1 OU scope, because this project is responsible for groundwater monitoring. Performance monitoring will be conduced within the engineered landfill caps as well as in the existing groundwater monitoring system.
- Sludge Removal. It is estimated that 106,000 liters (28,000 gallons) of sludge and 378 liters (100 gallons) of supernatant liquids remain in the 241-U-361 Settling Tank. Because of the amount and nature of the material in the tank, it is assumed that the sludge will require removal regardless of the final remedy.

The alternatives evaluated in the FFS include the following.

- **Alternative 1: No Action**
- **Alternative 2: Institutional Controls and Natural Attenuation.** Under this alternative, existing soil covers would be maintained as needed and would be available to provide protection from intrusion by biological receptors, along with legal and physical barriers to prevent human access to the site.
- **Alternative 3: Remove and Dispose.** Under this alternative, structures and soil with contaminant concentrations above PRGs would be excavated using conventional techniques and would be disposed to an approved disposal facility, most probably the ERDF. Contaminant concentrations exceeding the human health direct contact or ecological PRGs would require removal to a maximum depth of 4.6 m (15 ft). Conversely, if groundwater protection is required, removal may be required beyond the 4.6 m depth, as practicable, to ensure that groundwater protection PRGs are met, or additional monitoring activities may be required to support groundwater protection evaluations.
- **Alternative 4: Capping.** Capping consists of constructing a surface barrier (e.g., evapotransporation barrier) over contaminated waste sites to prevent infiltration of water and/or to prevent intrusion by human or ecological receptors. The capping uses the barrier for groundwater and human health

protection as well as for ecological protection from contaminants.

EVALUATION OF ALTERNATIVES

The FFS summary of the representative site risks (see Appendix C), in concert with Figure 2, provides the logic for determining which alternatives are applicable under specific conditions. Appendix C and Figure 2 support the determination of appropriate alternatives to be evaluated for each representative site and its associated analogous waste sites, and they provide the basis for the following evaluation of alternatives. This summary is found in Appendix D. Appendix A provides a summary of the cost estimates for each applicable waste site and alternative.

The alternatives were evaluated against the following CERCLA criteria:

- Overall protection of human health and the environment
- Compliance with ARARs
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, or volume through treatment
- Short-term effectiveness
- Implementability
- Cost
- State acceptance
- Community acceptance.

The first two criteria, overall protection of human health and the environment and compliance with ARARs, are threshold criteria. Alternatives that do not protect human health and the environment or that do not comply with ARARs (or justify a waiver) do not meet statutory requirements and are eliminated from further consideration in the FFS. The next five criteria (long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost) are balancing criteria on which the remedy selection is based.

The CERCLA guidance for conducting feasibility studies lists appropriate questions to be answered when evaluating an alternative against the balancing criteria (EPA/540/G-89/004, *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA*). The detailed analysis process presented in the FFS addresses these questions, providing a consistent basis for the evaluation of each alternative. The final two criteria, state and community acceptance, are modifying criteria. The criterion of state acceptance is addressed through this proposed plan, which is prepared by the Tri-Parties. The proposed plan identifies the preferred remedies accepted by the Tri-Parties. The criterion of community acceptance will be evaluated following the public review and comment period for this proposed plan.

Alternative 1 - No Action

The no-action alternative does not provide overall protection of human health and the environment where contaminants that are at concentrations above the PRGs would remain onsite.

However, there are four waste sites where, upon confirmatory sampling, implementation of the no action alternative is considered appropriate. These sites include:

- 200-W-56 and 200-W-57 Dumps, because both waste sites were equipment laydown or staging areas and are understood not to have contained hazardous or radioactive contaminants. Both of these sites are similar to the 200-W-CSLA, another U Plant Closure Area waste site that is a rejected under the Tri-Party Agreement.
- UPR-200-W-8 Pit unplanned release, because this waste site that may have been cleaned up in the 1970s.
- 2607-W7 Septic Tank, because this waste site was abandoned in 1999 in accordance with the requirements of WAC 246-272-1851.

Alternative 2 –Maintain Existing Soil Cover, Institutional Controls, and Monitored Natural Attenuation

The maintain existing soil cover, institutional controls, and monitored natural attenuation alternative would provide overall protection of human health and the environment for sites that show protection of groundwater and achieve direct exposure protection within 150 years. All of the representative waste sites in the U Plant Closure Area exceed the human health protection criteria when evaluated without considering the existing soil cover and, with the exception of the 216-U-4 Reverse Well / 216-U-4A French Drain and UPR-200-W-19 OU waste sites, they exceed the groundwater protection criteria. As such, this alternative is protective for a select number of sites within the U Plant Closure Area.

In addition, the 221-U Building is undergoing a concurrent CERCLA process (DOE/RL-2001-11, *Final Feasibility Study for the Canyon Disposition Initiative*), with the anticipated remedy including the placement of a barrier. The boundary of the effective barrier covers several sites addressed within this FFS. Implementation of the barrier at the 221-U Building would allow these sites to undergo institutional controls and, in concert with the 221-U barrier, therefore would be protective. These sites include:

- 216-U-4 Reverse Well and 216-U-4A French Drain
- UPR-200-W-118 unplanned release
- UPR-200-W-78 unplanned release
- 2607-W7 Septic Tank.

The remaining representative waste sites exceed the groundwater protection PRG primarily for nitrates and technetium-99, both of which are being addressed in the 200-UP-1 groundwater OU. These waste sites meet the human health PRG when the existing soil cover is included in the evaluation.

Application of this alternative complies with potential ARARs, because it is protective of human health and the environment and protective of groundwater at the identified waste sites.

The Alternative 2 representative site present-worth values (in $1,000) including capital cost and operation and maintenance (O&M) cost are as follows:

- 216-U-8 Crib - $389
- 216-U-12 Crib - $389
- 216-U-4 Reverse Well / 216-U-4A French Drain - $193
- UPR-200-W-19 unplanned release - $184.

Alternative 3 – Remove and Dispose

Alternative 3 would remove contaminated waste and soil from waste sites to a depth of up to 4.6 m (15 ft) bgs, or to the bottom of the engineered structure to meet the PRGs. This would eliminate the potential exposure pathways for receptors from soils located at depths between the surface and 4.6 m (15 ft) bgs. Depending on the depth of contamination, soils may be removed to protect human and ecological receptors (up to 4.6 m [15 ft]) from direct contact with contaminants or may be removed to greater depths if required and practicable to meet groundwater protection PRGs. Below-ground structures (e.g., cribs, tanks, pipelines) would be removed or abandoned according to current regulations. Clean excavated soil would be used as backfill, and contaminated soil would be disposed of at the ERDF.

For representative site UPR-200-W-19, this alternative is implementable and is considered protective of human health and the environment, because this site does not have deep contamination concerns (i.e., protection of groundwater), and the removal and disposal of shallow soils effectively provides the necessary protection.

For those sites with deep contamination (i.e., representative sites 216-U-8 Crib, 216-U-12 Crib) additional institutional controls, as discussed in Alternative 2, would be required for continued groundwater and natural attenuation monitoring associated with the contaminants at depth. Because the majority of contaminants would be removed from a waste site under this alternative and placed in an approved disposal facility, failure of this alternative is not a likely scenario. Verification sampling to determine that PRGs are met by the removal activities would verify that contaminants remaining do not pose unacceptable risks. In addition, monitoring of the area performed as part of the 200-UP-1 OU groundwater monitoring program would verify that groundwater has been adequately protected.

This alternative would comply with ARARs by removing soil that exceeds the PRGs, removing or abandoning structures. Where contaminants remain at depth that exceed the groundwater protection criterion, vadose zone or groundwater monitoring may be required to show protectiveness of groundwater.

The removal of contaminated soils and debris from these sites for redisposal on the Hanford Site at the ERDF transfers the long-term impact of contaminants from an individual site to one consolidated disposal facility. The ERDF is designed for long-term management of buried waste.

Alternative 3 representative site present-worth values (in $1,000) including capital cost and operation and maintenance cost are as follows:

- 216-U-8 Crib - $2,172
- 216-U-12 Crib - $583
- 216-U-4 Reverse Well / 216-U-4A French Drain - $118

- UPR-200-W-19 unplanned release - $2,066.

Alternative 4 – Capping

This alternative would break potential exposure pathways to receptors through placement of a surface barrier and institutional controls. Institution controls would be maintained at capped sites until the PRGs are achieved through natural attenuation. Performance monitoring of the barriers will provide an early warning detection system for moisture movement, which is the primary driving force for vertical contaminant transport. A performance monitoring system also allows best management practices to be implemented (e.g., thicken the cap, further prevent run-on), to prevent or mitigate groundwater contamination. The deployment of an appropriate barrier will provide additional intrusion protection past the 150-year institutional controls period and also would provide infiltration control to protect groundwater.

Groundwater monitoring would be coordinated with the 200-UP-1 groundwater OU at those waste sites that have uncertainty associated with mobile contaminants (i.e., nitrates, technetium-99) at depth. These sites are considered high-risk sites and include the 216-U-8 Crib, 216-U-12 Crib, and 216-U-1 and 216-U-2 Cribs.

This alternative would comply with ARARs for those waste sites that can be mitigated through eliminating the pathways from direct exposure and limiting contaminant migration for constituents that exceed the groundwater protection criteria. Contaminants that exceed the groundwater protection criteria will be monitored in coordinating with the 200-UP-1 OU to show protectiveness of groundwater for those sites with contaminants remaining.

A capping demonstration project (i.e., Hanford Barrier) has been implemented on the Hanford Site. Other types of barriers (i.e., evapotransiration barriers) have not been used at the Hanford Site but have been implemented at other western arid sites, have been approved by various regulatory agencies, and are easy to construct, significantly less expensive than the standard caps that have been used in the past, easy to maintain, and self-healing in the event of future subsidence and/or seismic events.

Alternative 4 representative site present-worth values (in $1,000), including capital cost and operation and maintenance cost, are as follows:

- 216-U-8 Crib - $1,595
- 216-U-12 Crib - $1,103
- 216-U-4 Reverse Well / 216-U-4A French Drain - $695
- UPR-200-W-19 unplanned release - $2,541.

NEPA Values

The NEPA process is intended to help Federal agencies make decisions that are based on understanding environmental consequences and then take actions that protect, restore, and enhance the environment. Overall, the long-term impacts of these remedial actions to the public would be extremely positive. The *Secretarial Policy on the National Environmental Policy Act* (DOE 1994) and the *National Environmental Policy Act Compliance Program* (DOE Order 451.1A) require that CERCLA documents incorporate NEPA values, such as analysis of cumulative, offsite, ecological, and socioeconomic impacts, to the extent practicable, in lieu of preparing separate NEPA documentation for CERCLA activities.

The NEPA-related resources and values that have been considered for these waste sites support the CERCLA and RCRA decision-making process. These values include:

- Transportation impacts
- Air quality
- Natural, cultural, and historical resources
- Noise, visual, and aesthetic effects
- Socioeconomic impacts
- Environmental justice
- Cumulative impacts (direct and indirect)
- Mitigation
- Irreversible and irretrievable commitment of resources.

Remedial actions at the U Plant Closure Area waste sites would result in some impacts to public health and the environment. However, the overall environmental impacts under normal operating conditions would not be very large, nor would they vary greatly among the remedial alternatives.

SUMMARY OF PREFERRED ALTERNATIVES

Four remedial alternatives were evaluated for the U Plant Closure Area waste sites. The preferred remedial alternative for each of the waste sites considered is shown in Table 3. The alternatives were evaluated for the representative sites with respect to the CERCLA criteria; then they were

evaluated against each other using the same criteria.

Alternative 1 – No Action: Based on existing information and process knowledge, the no-action alternative meets the RAOs for the following waste sites:

- 200-W-56 Dump
- 200-W-57 Dump
- UPR-200-W-8 Pit
- 2607-W7 Septic Tank.

The remaining alternatives evaluated provide varying levels of protection at a range of costs. For sites that have contaminant concentrations that will be above PRGs beyond about 150 years, engineered caps provide sufficient protection from biological and human intrusion, in combination with institutional controls. Removing contaminated soil provides the highest degree of protection but, depending on the depth of contamination, may be the highest cost. The risk reductions associated with these actions are considered small because the starting risks are currently near RAOs and groundwater use is currently limited.

Alternative 2 – Maintain Existing Soil Cover, Institutional Controls, and Monitored Natural Attenuation is the preferred alternative for the following waste sites:

- 241-U-361 Settling Tank
- 216-U-16 Crib
- 216-U-17 Crib
- 216-U-4 Reverse Well and 216-U-4A French Drain
- UPR-200-W-19 unplanned release
- 2607-W5 Septic System
- 200-W-71 Pit
- UPR-200-W-118 unplanned release
- UPR-200-W-33 unplanned release
- UPR-200-W-48 unplanned release
- UPR-200-W-55 unplanned release
- 200-W-77 unplanned release
- UPR-200-W-78 unplanned release
- 200-W-85 unplanned release
- 200-W-87 unplanned release
- 200-W-89 Foundation
- UPR-200-W-117/UPR-200-W-60 unplanned releases.

Alternative 3 - Remove and Dispose is the preferred alternative for the following waste sites:

- 200-W-42 Vitrified Clay Pipeline / UPR-200-W-163 unplanned release
- 216-U-5 Trench
- 216-U-6 Trench
- 216-U-15 Trench
- 216-U-4B French Drain.

Alternative 4 - Capping is the preferred alternative for the following high risk waste sites:

- 216-U-8 Crib
- 216-U-1 and 216-U-2 Cribs
- 216-U-12 Crib.

RCRA TSD UNIT CLOSURE PERFORMANCE STANDARDS AND CLOSURE STRATEGY

The proposed closure strategy for the 216-U-12 Crib TSD unit is Alternative 4 - Capping. The Implementation Plan (DOE/RL-98-28) prescribes the integration of the RCRA closure process with the CERCLA process. In accordance with the Implementation Plan, the elements of the TSD unit closure are to be addressed in the CERCLA OU RI/FS documentation. These elements have been summarized in Section 1.4 of DOE/RL-2003-23.

This closure strategy is consistent with the requirements specified in WAC 173-303-665 (6), "Landfill,"– "Closure and Post-Closure Care." This alternative will provide long-term minimization of the migration of liquids through the closed facility, through maintenance of the cap, managing drainage and minimizing erosion of the cover, and accommodating settling and subsidence such that the integrity is maintained, with a reduced permeability. Following closure, postclosure requirements are maintained through cap maintenance (e.g., barrier integrity), monitoring (e.g., barrier performance and groundwater monitoring), and the management of run-on/runoff.

SUPPORTING DOCUMENTS

The public is encouraged to read the following documents to gain a better understanding of the 200 Areas and the 200-UP-1 OU:

40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan," Appendix B, "National Priority List".

64 FR 61615, "Hanford Comprehensive Land-Use Plan Environmental Impact Statement, Hanford Site, Richland, Washington; Record of Decision (ROD)," *Federal Register*, Vol. 64, No. 218, pp. 61615ff, November 12, 1999.

BHI-00174, *U Plant Aggregate Area Management Study* Technical Baseline Report.

BHI-00268, *216-U-8 and UN-216-W-33 Interim Stabilization* Final Report.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 USC 9601, et seq.

DOE, 1994, *Secretarial Policy on the National Environmental Policy Act* (memorandum from H. R. O'Leary, Secretary of Energy, for Secretarial Officers and Heads of Field Elements, June 13), U.S. Department of Energy, Washington, D.C.

DOE/EIS-0222-F, *Final Hanford Comprehensive Land-Use Plan and Environmental Impact Statement.*

DOE Order 451.1A, *National Environmental Policy Act Compliance Program.*

DOE/RL-91-40, *Hanford Past-Practice Strategy.*

DOE/RL-91-52, *U Plant Source Aggregate Area Management Study Report.*

DOE/RL-93-33, *Focused Feasibility Study of Engineering Barriers for Waste Management Units in the 200 Areas.*

DOE/RL-95-13, *Limited Field Investigation for the 200-UP-2 Operable Unit.*

DOE/RL-95-106, *Focused Feasibility Study for the 200-UP-2 Operable Unit.*

DOE/RL-96-81, Rev. 0, *Waste Site Grouping for 200 Areas Soil Investigations.*

DOE/RL-96-92, *Hanford Strategic Plan.*

DOE/RL-98-28, Rev. 0, *200 Areas Remedial Investigation/Feasibility Study Implementation Plan – Environmental Restoration Program.*

DOE/RL-2000-60, *200-PW-2 Uranium-Rich Process Waste Group Operable Unit RI/FS Work Plan and Process Waste RCRA TSD Unit Sampling Plan*DOE/RL-2001-54, Draft B, *Central Plateau Ecological Evaluation.*

DOE/RL-2001-11, Rev. 0, *Final Feasibility Study for the Canyon Disposition Initiative.*

DOE/RL-2001-54, *Ecological Evaluation of the Hanford 200 Areas – Phase 1: Compilation of Existing 200 Areas Ecological Data.*

DOE/RL-2002-68, *Hanford's Groundwater Management Plan: Accelerated Cleanup and Protection.*

DOE/RL-2003-23, *Focused Feasibility Study for the U Plant Closure Area Waste Sites.*

Drummond, M.E., 1992, *The Future for Hanford: Uses and Cleanup, The Final Report of the Hanford Future Site Uses Working Group.*

EPA/540/G-89/004, 1989, *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA.*

EPA 541-R99-039, 1999, *EPA Superfund Record of Decision: Hanford 100- and 200-Area (USDOE) OUs 15 and 27, Benton County, WA.*

HAB, 2002, *Report of the Exposure Scenarios Task Force*, Hanford Advisory Board, Richland, Washington.

HAB #132, 2002, "Exposure Scenarios Task Force on the 200 Area," (letter), Hanford Advisory Board Consensus Advice #132, Richland, Washington.

Hanford Federal Facility Agreement and Consent Order, 1989, as amended.

Hedges, J., 2000, "Approval of the Contained-In Determination Request for Hydrazine," (letter), Washington State Department of Ecology, Kennewick, Washington, June 22.

Klein, K. A., Einan, D. R., and Wilson, M. A., 2002, "Consensus Advice #132: Exposure Scenarios Task Force on the 200 Area," (letter) U.S. Department of Energy, Richland, Washington.

National Environmental Policy Act of 1969, 42 USC 4321, et seq.

PNNL-13788, *Hanford Site Groundwater Monitoring for Fiscal Year 2001.*

Resource Conservation and Recovery Act of 1976, 42 U.S.C. 6901, et seq.

WA7890008967, 1994, *Hanford Facility RCRA Permit*, Washington State Department of Ecology, Olympia, Washington.

WAC 173-303, "Dangerous Waste Regulations," *Washington Administrative Code.*

WAC 173-340, "Model Toxics Control Act -- Cleanup," *Washington Administrative Code.*

WAC 246-272, "On-Site Sewage Systems," *Washington Administrative Code.*

Waste Information Data System Report, Hanford Site database.

WHC-SD-DD-TI-063, *216-U-1 and 216-U-2 Cribs Interim Stabilization* Final Report

ADMINISTRATIVE RECORD

The Administrative Record can be reviewed at the following locations:

Lockheed Martin Information Technology
Administrative Record
2440 Stevens Center Place, Room 1101
Richland, Washington 99352
POC: Debbi Isom
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Representative (Region 10)
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Washington State Department of Ecology
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INFORMATION REPOSITORIES

This Proposed Plan is available for viewing at the following public information repositories:

University of Washington
Suzzallo Library Government Publications
Seattle, Washington 98195
206/543-1937
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509/323-3839
ATTN: Connie Scarpelli

Portland State University,
Branford Price Millar Library
934 SW Harrison
Portland, Oregon 97207-1151
503/725-3690

U.S. Department of Energy Public Reading Room
Washington State University
Consolidated Information Center, Room 101L
2770 University Drive
Richland, Washington 99352
509/372-7443
ATTN: Terri Traub

Figure 1. Location of the U Plant Closure Area in the 200 West Area, Hanford Site.

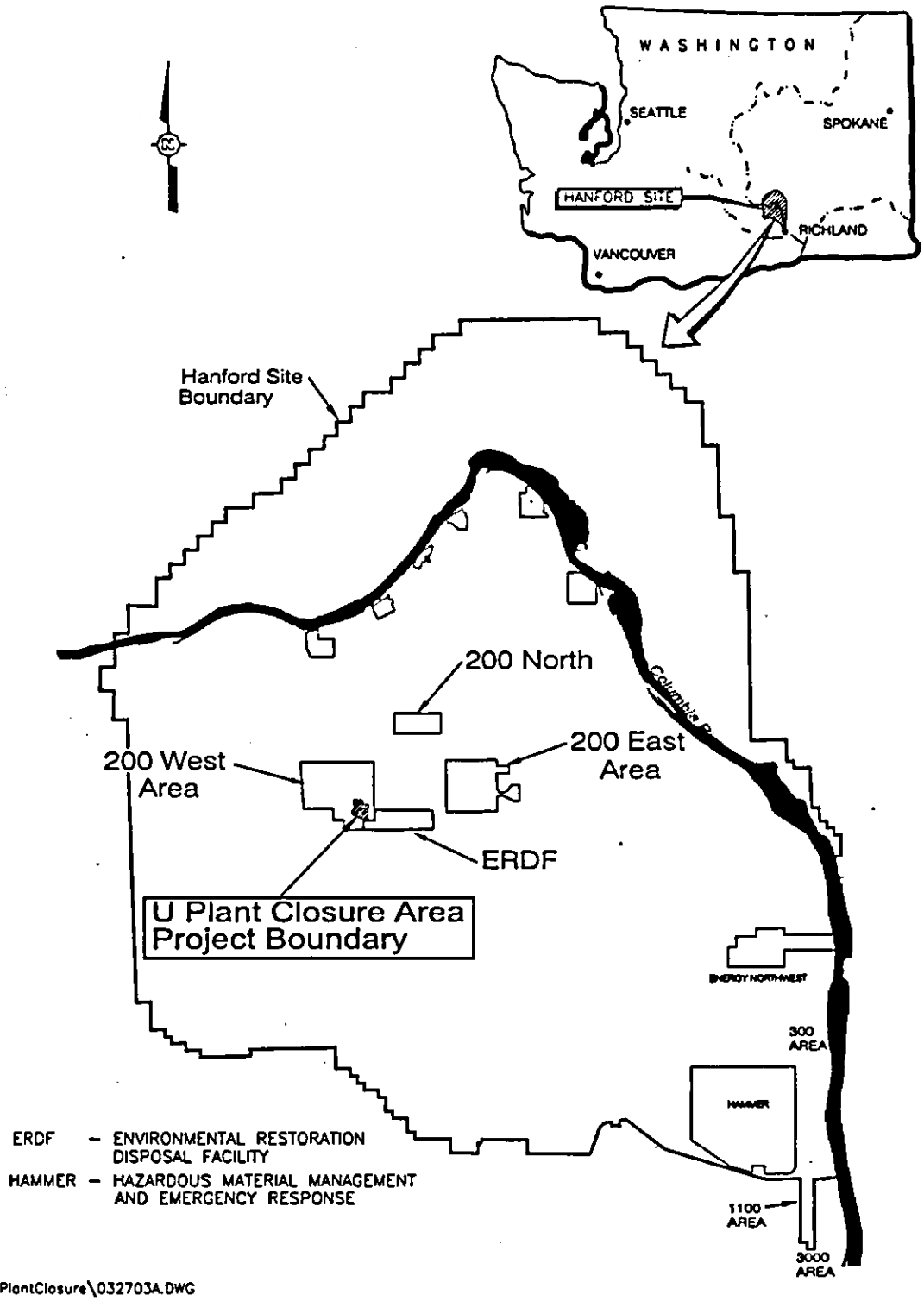

Figure 2. Logic Diagram for Selecting Applicable Alternatives.

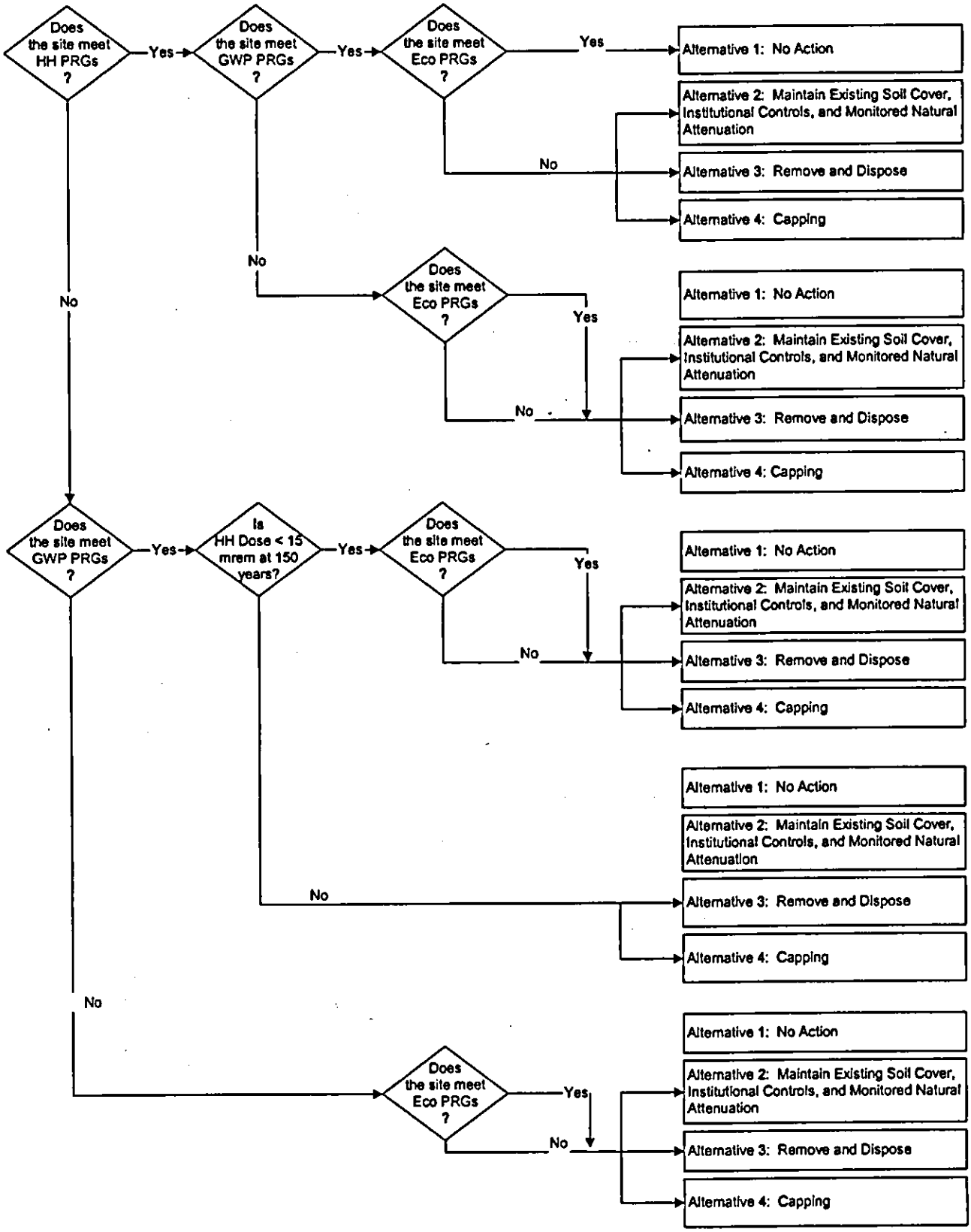

Table 1. Summary of Nonradionuclide Soil Preliminary Remediation Goals for All Pathways.

Constituent	Hanford Site Background [a] (mg/kg)	Direct Contact [b] (mg/kg)	Groundwater Protection [c] (mg/kg)	Terrestrial Wildlife Protection [d] (mg/kg)	Overall PRG [e] (mg/kg)
Nitrate (as Nitrogen)	52 (as nitrate)	350,000	40	--	40
Uranium	3.21	10,500	1.3	--	3.21

NOTES: Shaded areas represent the pathway driver for the overall PRG.

[a] Background concentrations are 90th percentile values of the log normal distribution of sitewide soil background data from DOE/RL-92-24. Where the applicable PRG for a constituent is less than background, the background value is used as the PRG.

[b] Direct contact values represent vadose zone concentrations that are protective of human and ecological receptors from direct contact with contaminated solids. Listed WAC 173-340-745 Method C cleanup standards for industrial soil are obtained from the Washington State Department of Ecology CLARC Version 3.1 tables (updated November 2001) (Ecology 94-145) and are used to evaluate the top 4.6 m (15 ft) (WAC 173-340-745).

[c] Values represent vadose zone soil concentrations that will be protective of groundwater. Values are calculated using the WAC 173-340 three-phase model for protection of drinking water (WAC 173-340-747[4], amended February 12, 2001).

[d] Industrial soil levels protective of terrestrial wildlife are obtained from WAC 173-340-900, Table 749-3.

[e] Listed values are used to evaluate the top 4.6 m (15 ft) and represent the most restrictive soil PRG derived from evaluation of direct contact, groundwater and river protection, and terrestrial wildlife protection. Below 4.6 m (15 ft), alternate cleanup levels may be required to meet RAOs based on verification of protectiveness of groundwater and the Columbia River during remedial actions.

DOE/RL-92-24, 1995, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*, Rev. 3, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Ecology 94-145, 1994, Model Toxics Control Act Cleanup Levels & Risk Calculations (CLARC Version 3.1), Washington State Department of Ecology, Olympia, Washington, as revised.

WAC 173-340, "Model Toxics Control Act – Cleanup," Washington Administrative Code, as amended, Washington State Department of Ecology, Olympia, Washington.

CLARC = Cleanup Levels and Risk Calculations under the Model Toxics Control Act Regulation.
PRG = preliminary remediation goal.
RAO = remedial action objectives.
– = no value established.

Table 2. Summary of Radionuclide Preliminary Remediation Goals for All Pathways.

Constituent	Direct Exposure[a] (pCi/g)		Terrestrial Wildlife BCG[c] (pCi/g)	Groundwater Protection[g] (pCi/g)	Overall PRG[d] (pCi/g)
	15 mrem/yr Dose	500 mrem/yr Dose[b]			
Americium-241	335	112,000	--	NA[e]	335
Cesium-137	23.4	780	20	NA[e]	20
Plutonium-239/240	425	14,200	--	NA[e]	425
Selenium-79	NA[e]	NA[e]	--	NA[f]	NA[e]
Technetium-99	412,000	13,700,000	--	171	171
Uranium (total)	608	20,800	--	81.5	81.5
Uranium-235	101	3,370	--	3.92	3.92
Uranium-238	504	20,800	--	38.1	38.1

NOTE: Shaded areas represent the pathway driver for the overall preliminary remediation goal (PRG).

[a]Direct exposure values represent activities for individual radionuclides corresponding to a 15 or 500 mrem/yr dose rate in an industrial scenario. Values will be lower for multiple radionuclides to achieve the same dose rate. Listed values are used to evaluate the top 4.6 m (15 ft) of the soil column.

[b]500 mrem/yr is the Hanford Site administrative control limit for radiological workers, not for the general public.

[c]Biota Concentration Guide (BCG) from DOE-STD-1153-2002.

[d]Listed values are used to evaluate the top 4.6 m (15 ft) and represent the most restrictive PRG derived from evaluation of the direct exposure, terrestrial wildlife, and river protection pathways. Below 4.6 m (15 ft) only groundwater values apply and alternate cleanup levels may be required to meet the RAOs based on verification of protectiveness of groundwater during remedial actions.

[e]NA = Not applicable. The RESRAD (ANL/EAD-4) and/or STOMP (PNNL-11217,) models predict that constituent at concentrations present in the representative sites will not reach groundwater within 1,000 years.

[f]NA = Not applicable as Selenium-79 does not have a groundwater protection regulatory limit.

[g]Listed values are based on 40 CFR 141 values and calculations.ANL/EAD-4, 2001, *User's Manual for RESRAD*, Version 6, Argonne National Laboratory, Environmental Assessment Division, Argonne, Illinois.

DOE-STD-1153-2002, *A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota*, DOE Technical Standard, U.S. Department of Energy, Washington, D.C.

PNNL-11217, 1997, *STOMP Subsurface Transport Over Multiple Phases Theory Guide*, Pacific Northwest National Laboratory, Richland, Washington.

BCG = biota concentration guide.
DOE = U.S. Department of Energy.
NA = Not Applicable
PRG = preliminary remediation goals.
RAO = remedial action objectives.
STOMP = Subsurface Transport Over Multiple Phases.

Table 3. Justification of each Preferred Remedial Alternative Selected for the U Plant Closure Area Waste Sites. (8 Pages)

Waste Site/Group	Alternative 1: No Action	Alternative 2: Maintain Existing Soil Cover, Institutional Controls, and Monitored Natural Attenuation	Alternative 3: Remove and Dispose	Alternative 4: Capping	Justification
Representative Site					
216-U-8 Crib				X	Cesium-137 currently exceeds human-health protection but is anticipated to decay within 141 years. Existing stabilization cover adequately mitigates the exposure pathway. Technetium-99 and nitrates soil concentrations in the vadose zone exceed groundwater protection: highest concentrations of technetium are located near surface; nitrate is well distributed throughout the soil column, with maximum concentrations at 60.4 m (198 ft) bgs. Placement of a cap and associated monitoring addresses source control and reduction in contaminant migration. The 216-U-8 Crib is considered a high-risk site.
Process Waste Group Analogous Sites to be Evaluated by the 216-U-8 Crib Model					
216-U-1 / 216-U-2 Cribs				X	Cesium-137 currently exceeds human-health protection but is anticipated to decay within 128 years. Existing stabilization cover adequately mitigates the exposure pathway. Technetium-99 soil concentrations in the vadose zone exceed groundwater protection, based on constituents between 6.7 m and 13.1 m (22 and 43 ft) bgs. Placement of a cap and associated monitoring addresses source control and reduction in contaminant migration. The 216-U-1 and 216-U-2 Cribs are considered high-risk sites.
241-U-361 Settling Tank		X			There is no information indicating that the tank has leaked or has contributed to vadose zone contamination that would indicate future groundwater protection concerns. Primary risk is associated with the sludge contained in tank. This alternative will remove the sludge. Site is located in close proximity to 216-U-1 and 216-U-2 Cribs and UPR-200-W-19. Confirmatory sampling may be required.

Table 3. Justification of each Preferred Remedial Alternative Selected for the U Plant Closure Area Waste Sites. (8 Pages)

Waste Site/Group	Alternative 1: No Action	Alternative 2: Maintain Existing Soil Cover, Institutional Controls, and Monitored Natural Attenuation	Alternative 3: Remove and Dispose	Alternative 4: Capping	Justification
200-W-42 Vitrified Clay Pipeline / UPR-200-W-163			X		Cesium-137 currently exceeds human-health protection but is anticipated to decay within 804 years. Existing stabilization cover adequately mitigates the exposure pathway. Uncertainty in the groundwater protection criterion may require confirmatory sampling before or during implementation.
Representative Site					
216-U-12 Crib				X	It is anticipated that cesium-137 concentrations exceed human-health protection but it is anticipated to decay within 141 years. Nitrate soil concentrations in the vadose zone exceed groundwater protection, based on constituents between 15.3 m and 64.6 m (50 and 212 ft) bgs. Limited analytical data exist; however, process knowledge and screening information indicate that uranium soil concentration in the vadose zone also may exceed groundwater protection. Placement of a cap and associated monitoring address source control and reduction in contaminant migration. The 216-U-12 Crib is considered a high-risk site.
Process Waste Group Analogous Sites to be Evaluated by the 216-U-12 Crib Model					
216-U-5 Trench			X		This trench was used one time only, for the disposal of unirradiated effluent, at a limited disposal volume. Human-health protection is expected to be bounded by the 216-U-12 Crib. Groundwater protection is assumed, because the limited disposal volume would indicate minimal vertical migration. Confirmatory sampling may be required.

Table 3. Justification of each Preferred Remedial Alternative Selected for the U Plant Closure Area Waste Sites. (8 Pages)

Waste Site/Group	Alternative 1: No Action	Alternative 2: Maintain Existing Soil Cover, Institutional Controls, and Monitored Natural Attenuation	Alternative 3: Remove and Dispose	Alternative 4: Capping	Justification
216-U-6 Trench			X		The trench was used one time only, for the disposal of unirradiated effluent, at a limited disposal volume. Human-health protection is expected to be bounded by the 216-U-12 Crib. Groundwater protection is assumed, because limited disposal volume would indicate minimal vertical migration. Confirmatory sampling may be required.
216-U-15 Trench			X		The trench was used one time only, for the discharge of one curie of fission product, at a limited volume. Human-health protection is expected to be bounded by the 216-U-12 Crib. Groundwater protection is assumed, because the limited disposal volume would indicate minimal vertical migration. Confirmatory sampling may be required.
216-U-16 Crib		X			Process knowledge indicates a limited mass loading of two orders of magnitude less uranium than the representative site, the 216-U-12 Crib. Human-health protection is expected to be bounded by, and more protective than, the 216-U-12 Crib. Groundwater protection is assumed, because the effluent was distributed over a much larger crib base than the representative site and would indicate minimal vertical migration.
216-U-17 Crib		X			Process knowledge indicates a limited mass loading of several orders of magnitude less uranium than the representative site, the 216-U-12 Crib. Human-health protection is expected to be bounded by, and more protective than, the 216-U-12 Crib. Groundwater protection is assumed, because effluent was distributed over a much larger crib base than the representative site and would indicate minimal vertical migration.

Table 3. Justification of each Preferred Remedial Alternative Selected for the U Plant Closure Area Waste Sites. (8 Pages)

Waste Site/Group	Alternative 1: No Action	Alternative 2: Maintain Existing Soil Cover, Institutional Controls, and Monitored Natural Attenuation	Alternative 3: Remove and Dispose	Alternative 4: Capping	Justification
Representative Site					
216-U-4 Reverse Well / 216-U-4A French Drain		X			Cesium-137 concentrations exceed human-health protection but are anticipated to decay by 125 years. Existing cover adequately mitigates the exposure pathway. Site is within groundwater protection PRGs. Site is within the boundary of the effective barrier anticipated for the 221-U Building. Institutional controls will be coordinated with the barrier placement over the 221-U Building and effectively barrier placement over this site.
Reverse Well/French Drain Group Analogous Site to be Evaluated by the 216-U-4 Reverse Well / 216-U-4A French Drain Model					
216-U-4B French Drain			X		Expected to be similar to the 216-U-4 Reverse Well and 216-U-4A French Drain. However, site is not within the boundary of the effective barrier anticipated for the 221-U Building. As such, removal of the contaminants, assumed to be within the near surface, is an appropriate and cost-effective remedy.
Representative Site					
UPR-200-W-19		X			Cesium-137 concentrations exceed human-health protection at near-surface, but are anticipated to decay by 129 years. Existing stabilization cover adequately mitigates the exposure pathway. Site is within groundwater protection PRGs. The key contamination area is in close proximity to the 216-U-1 and 216-U-2 Cribs and will be addressed adequately in concert with the remedy associated with those cribs. The portion of the site beyond the area associated with the 216-U-1 and 216-U-2 Cribs has limited contaminants and, considering the existing stabilization cover, is adequately protective.

Table 3. Justification of each Preferred Remedial Alternative Selected for the U Plant Closure Area Waste Sites. (8 Pages)

Waste Site/Group	Alternative 1: No Action	Alternative 2: Maintain Existing Soil Cover, Institutional Controls, and Monitored Natural Attenuation	Alternative 3: Remove and Dispose	Alternative 4: Capping	Justification
Septic System Group Analogous Sites to be Evaluated by the UPR-200-W-19 Model					
2607-W5 Septic System		X			Human-health protection is expected to be bounded by UPR-200-W-19. The site is located near the 216-U-1 and 216-U-2 Cribs and the 241-U-361 Settling Tank. The septic system will be abandoned per the WAC (i.e., pumped and stabilized) before it is addressed under this program.
2607-W7 Septic Tank	X				Human-health protection is expected to be bounded by UPR-200-W-19. The site was abandoned per the WAC (i.e., pumped and stabilized); it is within the boundary of the effective barrier anticipated for the 221-U Building.
Solid Waste Group Analogous Sites to be Evaluated Using the UPR-200-W-19 Model					
200-W-56 Dump	X				Human-health protection is expected to be bounded by UPR-200-W-19. It is similar to the 200-W-CSLA (a construction surface laydown area), which is a rejected site based on process knowledge indicating that no hazardous or radioactive wastes were disposed of at the dump. Process knowledge on this site indicates no hazardous or radioactive waste disposal as well. Confirmatory sampling may be required.
200-W-57 Dump	X				Human-health protection is expected to be bounded by UPR-200-W-19. It is similar to the 200-W-CSLA, which is a rejected site based on process knowledge indicating that no hazardous or radioactive wastes were disposed of at the dump. Process knowledge on this site indicates no hazardous or radioactive waste disposal as well. Confirmatory sampling may be required.

Table 3. Justification of each Preferred Remedial Alternative Selected for the U Plant Closure Area Waste Sites. (8 Pages)

Waste Site/Group	Alternative 1: No Action	Alternative 2: Maintain Existing Soil Cover, Institutional Controls, and Monitored Natural Attenuation	Alternative 3: Remove and Dispose	Alternative 4: Capping	Justification
200-W-71 Pit		X			This is a solid waste site. Human-health protection is expected to be bounded by UPR-200-W-19. Process knowledge indicates that radioactive waste may have been disposed of at this pit. Confirmatory sampling is required to reduce the constituent uncertainty and support determination of an appropriate institutional control period.
UPR-200-W-8 Pit	X				This is a solid waste site. Human-health protection is expected to be bounded by UPR-200-W-19. The site might have been cleaned up adequately in the 1970s; confirmatory sampling is required. It is similar to the 200-W-CSLA, which is a rejected site based on process knowledge indicating that no hazardous or radioactive wastes were disposed of at the dump. Process knowledge on this site indicates no hazardous or radioactive waste disposal as well. Confirmatory sampling may be required to reduce the constituent uncertainty and support determination of an appropriate institutional control period.
Unplanned Release Group Analogous Sites to be Evaluated Using the UPR-200-W-19 Model					
UPR-200-W-118		X			Expected to be bounded by UPR-200-W-19; this is a solid waste site. The site is within the boundary of the effective barrier anticipated for the 221-U Building. Institutional controls will be coordinated with the 221-U Building disposition. Confirmatory sampling may be required.

Table 3. Justification of each Preferred Remedial Alternative Selected for the U Plant Closure Area Waste Sites. (8 Pages)

Waste Site/Group	Alternative 1: No Action	Alternative 2: Maintain Existing Soil Cover, Institutional Controls, and Monitored Natural Attenuation	Alternative 3: Remove and Dispose	Alternative 4: Capping	Justification
Shallow/Surface Waste Site Group Analogous Sites to be Evaluated Using the UPR-200-W-19 Model					
200-W-77 unplanned release		X			Expected to be bounded by UPR-200-W-19. Process knowledge indicates limited release (e.g., residuals from blown-in tumbleweed) affecting a shallow surface area. Confirmatory sampling may be required to reduce the constituent uncertainty and support determination of an appropriate institutional control period.
200-W-85 unplanned release		X			Expected to be bounded by UPR-200-W-19. Process knowledge from field surveys indicates limited release affecting a shallow surface area. Confirmatory sampling may be required to reduce the constituent uncertainty and support determination of an appropriate institutional control period.
200-W-87 unplanned release		X			Expected to be bounded by UPR-200-W-19. Process knowledge indicates limited release (i.e., potential residuals from train residuals on the siding) affecting a shallow surface area. Confirmatory sampling may be required to reduce the constituent uncertainty and support determination of an appropriate institutional control period.
200-W-89 Foundation		X			Expected to be bounded by UPR-200-W-19. Process knowledge indicates limited release (i.e., residual contamination surrounding electrical substation) affecting a shallow surface area.. Confirmatory sampling may be required to reduce the constituent uncertainty and support determination of an appropriate institutional control period.

Table 3. Justification of each Preferred Remedial Alternative Selected for the U Plant Closure Area Waste Sites. (8 Pages)

Waste Site/Group	Alternative 1: No Action	Alternative 2: Maintain Existing Soil Cover, Institutional Controls, and Monitored Natural Attenuation	Alternative 3: Remove and Dispose	Alternative 4: Capping	Justification
UPR-200-W-33		X			Expected to be bounded by UPR-200-W-19. Process knowledge indicates limited release (i.e., residuals from a surface condensate leak that was immediately removed and covered with clean fill) affecting a shallow surface area. Confirmatory sampling may be required to reduce the constituent uncertainty and support determination of an appropriate institutional control period.
UPR-200-W-48		X			Expected to be bounded by UPR-200-W-19. Process knowledge indicates limited release affecting a shallow surface area. Confirmatory sampling may be required to reduce the constituent uncertainty and support determination of an appropriate institutional control period.
UPR-200-W-55		X			Expected to be bounded by UPR-200-W-19. Process knowledge indicates limited release (i.e., residuals from swept up and rinsed uranium powder spills) affecting a shallow surface area. Confirmatory sampling may be required to reduce the constituent uncertainty and support determination of an appropriate institutional control period.
UPR-200-W-78		X			Expected to be bounded by UPR-200-W-19. Site is within the boundary of the effective barrier anticipated for the 221-U Building. Institutional controls will be coordinated with the 221-U Building disposition. Confirmatory sampling may be required.
UPR-200-W-117 / UPR-200-W-60		X			Expected to be bounded by UPR-200-W-19. Process knowledge indicates limited release (i.e., residuals from equipment moved via the railroad spur) affecting a shallow surface area. Confirmatory sampling may be required to reduce the constituent uncertainty and support determination of an appropriate institutional control period.

bgs = below ground surface.
CSLA = construction surface laydown area
PRG = preliminary remediation goal.
WAC = *Washington Administrative Code*

GLOSSARY AND TERMS

The first use of technical terms and other specialized text in this Proposed Plan is shown in bold in the document and defined below.

Administrative Record - The files containing all the documents used to select a response action at a CERCLA remedial action site. Locations where the Administrative Record for the Hanford Site is maintained were previously provided in this document.

Analogous site – A waste site in an OU that is analogous to a representative site because of similar waste disposal practices, construction, geology, volumes of effluent and contaminants, and other factors.

Applicable or relevant and appropriate requirements (ARAR) - Those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, or that address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to the particular site.

Capping – A remedial alternative that relies on placement of a physical barrier over a waste site to prevent intrusion by humans and/or biota; may also be designed to limit infiltration of precipitation to provide protection of groundwater by limiting mobilization of contaminants in the vadose soils.

Characterization - Identification of the characteristics of a site, often through review of existing site information and/or sampling and analysis of environmental media and materials, to determine the nature and extent of contamination so informed decisions can be made as to the level of risk presented by the site and, therefore, the appropriate remedial response can be made.

Clean closure – A TSD is closed pursuant to RCRA such that contaminant concentrations are below levels of concern and no RCRA constituents remain that would pose a threat to human health or the environment.

CLUP-EIS – *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement* – DOE/EIS-0222-F

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 **(CERCLA)** – A Federal law that establishes a program to provide for the identification of hazardous waste sites to ensure that sites are cleaned up, and to allow government entities to evaluate damages to natural resources. CERCLA is also known as the "Superfund."

Contaminants of concern (COC) – A focused list of radioactive and chemical constituents that may be found at various waste sites.

Decontamination and decommissioning – Stabilization and maintenance or removal of inactive surplus facilities to reduce potential environmental, human health, and safety hazards.

Ecology – Washington State Department of Ecology.

Environmental Restoration Disposal Facility (ERDF) - The Hanford Site's disposal facility for most waste and contaminated environmental media (contingent upon meeting the ERDF waste acceptance criteria) generated under a CERCLA remedial action. The ERDF currently receives wastes from ongoing remedial actions in the 300 Area and at other Hanford NPL sites.

EPA – U.S. Environmental Protection Agency.

FFS – Focused Feasibility Study – DOE/RL-2003-23

HAB – Hanford Advisory Board.

Hanford Federal Facility Agreement and Consent Order **(Tri-Party Agreement)** – An agreement and consent order between DOE, EPA, and Ecology that details the process to be used to address CERCLA, RCRA, and state requirements for closing the Hanford Site.

Implementation Plan – DOE/RL-98-28.

Industrial-exclusive – A land-use designation under the CLUP-EIS that applies to the 200 Areas core zone. Under this land-use designation, waste management activities would continue. This land use assumes an industrial exposure scenario.

Institutional controls – Nonengineered instruments, such as administrative and/or legal controls, that minimize the potential for exposure to contamination by limiting land or resource use. The State of Washington also considers physical controls, such as fencing and signs, to be institutional controls as well.

National Environmental Policy Act of 1969 **(NEPA)** - A Federal law that establishes a program to prevent and eliminate damage to the environment. Values for this act encompass a range of environmental concerns.

National Priority List (NPL) - A list of top-priority hazardous waste sites in the United States that are eligible for investigation and cleanup under Superfund (40 CFR 300, Appendix B).

Natural attenuation – A decrease in concentration of a contaminant due to natural processes, such as radioactive decay, oxidation/reduction, biodegradation, and/or sorption.

Observational approach - A method of planning, designing, and implementing a remedial action that uses a limited amount of initial field characterization data to create a general understanding of the site conditions. Information that is gathered during the remedial action phase is used to make real-time decisions to guide the remedial action. For some sites, this method is considered more cost- and time-effective than traditional methods that require large amounts of initial data to make detailed plans and designs for remedial actions.

Operable unit (OU) - As applied to the Hanford Site, an OU is a group of land disposal sites or groundwater plumes placed together for the purposes of investigation and subsequent cleanup actions.

Preliminary remediation goals (PRG) – Initial cleanup levels that are developed during the CERCLA decision-making process. PRGs may be refined in the ROD to become final cleanup levels (i.e., remediation goals).

Proposed Plan - The plan that presents the preferred alternatives for remedial action of waste sites to the public by the responsible parties. The proposed plan is developed based on the results of feasibility studies performed on the waste sites (in this case, the FFS for the U Plant Closure Area Waste Sites).

Record of decision (ROD) - The formal document under CERCLA or NEPA in which the lead regulatory agency sets forth the selected remedial measure and provides the reasons for its selection.

Remedial action objectives (RAO) – General descriptions of what the remedial action will accomplish (e.g., restoration of groundwater).

Remedial alternative - General or specific actions that are evaluated to determine the extent to which they can eliminate or minimize threats posed by contaminants to human health and the environment.

Remedial investigation (RI) – A data collection activity under CERCLA that includes sampling and analysis to identify the nature and extent of contaminants at a waste site.

Remove and Dispose – A cleanup method where soil and debris are excavated such that no contaminants above the approved remediation goals for direct exposure, groundwater, and river protection remain at the site. Excavated material is treated (as necessary) and sent to an engineered facility for disposal.

Representative site – A waste site in an OU that either typifies or bounds the contaminant characteristics of the waste sites in the OU. A representative site is selected based on the types and volumes of effluents and contaminants discharged to the site, the construction of the waste site, the physical characteristics and setting of the area around the waste site, availability of data, and other site-specific factors. The representative sites are characterized during the RI to determine the nature and vertical extent of contamination. This information is used to support the decision-making process for the OU.

Resource Conservation and Recovery Act of 1976 **(RCRA)** - A Federal law that establishes requirements for the storage, treatment, and disposal of hazardous waste.

SEPA – State Environmental Protection Act (RCW 43.21C).

Treatment, storage, and disposal (TSD) unit – A RCRA site used to treat, store, or dispose of hazardous waste.

Tri-Parties – U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy.

Waste sites - Sites that are contaminated or are potentially contaminated due to past operations. Contamination may be contained in environmental media, such as soil or groundwater, or in man-made structures or waste, such as debris.

REFERENCES

DOE/RL-91-52, 1992, *U Plant Source Aggregate Area Management Study Report*, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-95-13, 1995, *Limited Field Investigation for the 200-UP-2 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-95-106, 1995, *Focused Feasibility Study for the 200-UP-2 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2000-60, *200-PW-2 Uranium-Rich Process Waste Group Operable Unit RI/FS Work Plan and Process Waste RCRA TSD Unit Sampling Plan*, U.S. Department of Energy, Richland Operations Office, Richland, Washington

DOE/RL-2001-11, 2001, *Final Feasibility Study for the Canyon Disposition Initiative (221-U Facility)*, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2001-29, 2001, *Proposed Plan for the Canyon Disposition Initiative (221-U Facility)*, Draft B, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

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APPENDIX A

SUMMARY OF SITE COST ESTIMATES

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Table A-1. Cost Estimates (in $1,000). (2 Pages)

Waste Site/Group	Alternative 1: No Action	Alternative 2: Maintain Existing Soil Cover, Institutional Controls, and Monitored Natural Attenuation	Alternative 3: Remove and Dispose	Alternative 4: Capping
Representative Site				
216-U-8 Crib [b]	-	$389	$2,172	$1,595
Process Waste Group Analogous Sites to be Evaluated by the 216-U-8 Crib Model				
216-U-1 Crib / 216-U-2 Crib [b]	-	$386	$1,093	$1,342
241-U-361 Settling Tank	-	$5,151	$4,987	$5,676
200-W-42 Vitrified Clay Pipeline / UPR-200-W-163	-	$393	$2,037	$2,906
Representative Site				
216-U-12 Crib	-	$389	$583	$1,103
Process Waste Group Analogous Sites to be Evaluated by the 216-U-12 Crib Model				
216-U-5 Trench	-	$389	$470	$1,007
216-U-6 Trench	-	$389	$453	$994
216-U-15 Trench	-	$389	$324	$899
216-U-16 Crib	-	$528	$1,955	$1,998
216-U-17 Crib	-	$389	$803	$1,195
Representative Site				
216-U-4 Reverse Well / 216-U-4A French Drain [b]	-	$193	$118	$695
Reverse Well/French Drain Group Analogous Sites to be Evaluated by the 216-U-4/216-U-4A Model				
216-U-4B French Drain	-	$193	$114	$692
Representative Site				
UPR-200-W-19	-	$184	$2,066	$2,541
Septic System Group Analogous Sites to be Evaluated by the UPR-200-W-19 Model				
2607-W5 Septic System	-	$46	$777	$1,927
2607-W7 Septic Tank [b]	-	$46	$391	$1,257

Table A-1. Cost Estimates (in $1,000). (2 Pages)

Waste Site/Group	Alternative 1: No Action	Alternative 2: Maintain Existing Soil Cover, Institutional Controls, and Monitored Natural Attenuation	Alternative 3: Remove and Dispose	Alternative 4: Capping
Solid Waste Group Analogous Sites to be Evaluated by the UPR-200-W-19 Model				
200-W-56 Dump	-	$46	$104	$695
200-W-57 Dump	-	$46	$125	$781
200-W-71 Pit	-	$46	$362	$1,003
UPR-200-W-8 Pit	-	$46	$919	$1,657
Unplanned Release Group Analogous Sites to be Evaluated by the UPR-200-W-19 Model				
UPR-200-W-118[b]	-	$184	$1,599	$1,596
Shallow/Surface Waste Site Group Analogous Sites to be Evaluated by the UPR-200-W-19 Model				
200-W-77 unplanned release	-	$46	$104	$696
200-W-85 unplanned release	-	$46	$106	$705
200-W-87 unplanned release	-	$46	$126	$785
200-W-89 Foundation	-	$46	$161	$928
UPR-200-W-33	-	$46	$104	$702
UPR-200-W-48	-	$46	$110	$721
UPR-200-W-55	-	$46	$104	$695
UPR-200-W-78[b]	-	$46	$103	$696
UPR-200-W-117/UPR-200-W-60	-	$46	$141	$846

Note: Cost details are in Appendix F of DOE/RL-2003-23, *Focused Feasibility Study for the U Plant Closure Area Waste Sites.*
[a]Net present worth taken over timeframe needed to reach industrial and ecological preliminary remediation goals.
[b]These waste sites are anticipated to be under the boundary of the effective barrier anticipated for the 221-U Building.

APPENDIX B

REPRESENTATIVE & ANALOGOUS WASTE SITE SUMMARY

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Table B-1. 216-U-8 Crib and Associated Analogous Waste Sites. (4 pages)

Waste Site	Waste Site Configuration, Construction, and Purpose	Current Waste Site Cover/Vegetation	Site and Discharge History	Rationale
Representative site				
216-U-8 Crib	The site is located approximately 137 m (450 ft) west of Beloit Avenue and 229 m (750 ft) south of 16th Street. The site consists of three wood timber cribs in series at the bottom of a backfilled trench that measures 48 by 15 m (160 by 50 ft).	Gravel	The crib received acidic process condensate from the 221-U and 224-U Buildings along with drainage from the 291-U-1 Stack. The crib was in operation from June 1952 to March 1960. The site was deactivated by blanking the pipeline approximately 18 m (60 ft) north of the unit when ground settling occurred around the crib vent risers. In 1994, the area over the crib and a portion of the vitrified clay pipeline was stabilized. Approximately 8 to 10 cm (3 to 4 in.) of soil were removed from the area above the vitrified clay pipeline (VCP) (200-W-42 VCP / UPR-200-W-163) and consolidated over the top of the 216-U-8 Crib. The area over the crib and consolidated soils was covered with about 0.5 to 0.6 m (1.5 to 2 ft) of soil.	The 216-U-8 Crib is an inactive crib (timbered) that received a high inventory of contaminants from uranium-rich and acidic process wastes discharged to the crib. Wastewater infiltrated into a thick vadose zone (75 m [247 ft]) via a subsurface drain field. Wastewater volumes (on the order of 379 million liters (100 million gal]) were significant enough to have reached the Cold Creek unit at 50 m (165 ft) bgs (where spreading could occur) and groundwater, as evidenced by the presence of uranium, tritium, and nitrite in the groundwater. Mobile contaminants were carried vertically deep into the vadose zone or to the groundwater, but with little lateral spreading. Immobile contaminants were retained in the upper vadose zone with maximum concentrations at the base of the crib (9 m [31 ft] bgs). Primary contaminants are Cs-137, uranium, and Sr-90. The zone of highest contamination is at the base of the crib (9 m [31 ft] bgs) to 13 m [42 ft] bgs. Cs-137 concentrations are highest from 9 to 13 m (30 ft to 42 ft) bgs (max value of 91,190 pCi/g at 9 [30 ft] bgs) with no detectable concentrations below 30 m (100 ft). Sr-90 was detected from 9 to 61 m [31 to 199 ft] with peak values near the base of the crib (130 pCi/g) and between 35 and 50 m (115 and 165 ft) (max value of 520 pCi/g at 35 and 50 m [115 and 165 ft] bgs) with concentrations < 20 pCi/g between 12 to 50 m [40 to 165 ft]). Uranium peaks near the base of the crib (28 pCi/g U-233/234 and 94 pCi/g U-238) and within the cold Creek unit (max values of 140 pCi/g U-233/234 and 150 pCi/g U-238 at 56 m [185 ft] bgs) with concentrations generally <20 pCi/g between 12 to 50 m (40 to 165 ft). Spectral gamma borehole logging indicated a maximum U-238 activity of 831 pCi/g at 12 m [38 ft]. Levels of Am-241, plutonium, and neptunium-237 are less than 1 pCi/g. This crib received the largest inventory of uranium of any U Plant Closure Area waste site, a significant portion of which reached groundwater.

Table B-1. 216-U-8 Crib and Associated Analogous Waste Sites. (4 pages)

Waste Site	Waste Site Configuration, Construction, and Purpose	Current Waste Site Cover/Vegetation	Site and Discharge History	Rationale
Process Waste Group analogous sites to be evaluated using the 216-U-8 Crib model				
216-U-1 & 216-U-2 Cribs	The site is north of 16th Street, west of the 221-U Building and east of the 207-U Retention Basin. The cribs are collocated in a common Underground Radioactive Material Area. Each crib is delineated with posts and chain with "Cave-In Potential" signs. The cribs consist of two wooden structures each measuring 3.6 by 3.6 by 1.2 m (12 by 12 by 4 ft). Each crib is located at the bottom of a 6.1 m (20 ft) deep excavation with 1:1 side slopes. The cribs rest on the underlying native soil. The cribs are spaced 18 m apart (60 ft) and are connected by an 8.9 cm (3.5 in.) diameter stainless steel pipeline. Gravel fill was not used in the cribs. A 2-in. stainless steel vent pipe was installed but blanked off and replaced with a 1/4 in. stainless steel line that extends from the surface to within 1 foot of the crib bottom. An 8-in. black iron test well casing extends from the surface through the center of each crib to a depth of 21 m (70 ft). U Plant wastes flowed to the 241-U-361 Settling Tank, which lies 30 m (100 ft) east of the 216-U-1 Crib.	Gravel and soil.	The cribs received overflow from the 241-U-361 Settling Tank. The tank received cell drainage from the 5-6 tank in the 221-U Building and waste from the 224-U Building until the Uranium Recovery process operations were shut down in 1957. From July 1957 through May 1967, the 216-U-1 & 216-U-2 Cribs received waste from the 224-U Building and equipment decontamination waste and reclamation waste from the 221-U Building Canyon. The area was surface stabilized by scraping the contaminated surface soil and consolidating it near the 241-U-361 Settling Tank. The contaminated soil was covered with 46 to 61 cm (18 to 24 in.) of clean backfill. The surface surrounding the 241-U-361 Settling Tank was covered with shotcrete. In 1994, contamination was found on the surface again, presumably caused by insect intrusion. Approximately 30 million liters (8 million gal) of groundwater were pumped and treated, using an ion-exchange column, between June and August 1985. An estimated 687 kg of uranium were removed. Portions of existing wells (299-W19-3, 299-W19-9, and 299-W19-11) were grouted to prevent vertical communication with the groundwater, and four new monitoring wells (299-W19-15, 299-W19-16, 299-W19-17, and 299-W19-18) were installed to characterize the uranium plume.	These cribs are analogous to the 216-U-8 Crib because: (1) they are inactive timbered cribs; (2) they received a similar uranium-rich waste stream; (3) they received millions of gallons of wastewater, although an order of magnitude less than the 216-U-8 Crib did; (4) they received similar contaminant inventories (less uranium and plutonium, but more Cs-137 and Sr-90) than the 216-U-8 Crib did; (5) the primary contaminants (Cs-137, uranium, and Sr-90) are similar but with the addition of technetium; (6) they have a similar contaminant distribution with maximum concentrations at the base of the crib (6 m [20 ft] bgs) and little lateral spreading; (7) mobile contaminants (uranium, technetium, and nitrate) have reached groundwater; (8) they have similar hydrogeology and a thick vadose zone. The distributions of Am-241, Co-60, Cs-137, and Sr-90 (maximum concentration of 33 pCi/g, 10.6 pCi/g, 1,700,000 pCi/g, and 2,400,000 pCi/g, respectively) are primarily limited to 6 to 12 m (20 to 40 ft) bgs. Uranium was detected through the vadose zone with peak values at 12 m (40 ft) (maximum concentration for U-233/234 of 1400 pCi/g and for U-238 of 10,080 pCi/g at 12 m [40 ft]) and within the Cold Creek unit (32 pCi/g for U-233/234 and 32 pCi/g for U-238). Spectral gamma borehole logging indicated a maximum U-238 activity of 5000 pCi/g at 12 m (39.5 ft). Although maximum contaminant levels are generally greater than those of the 216-U-8 Crib, the distribution is much more confined to the upper vadose zone.

Table B-1. 216-U-8 Crib and Associated Analogous Waste Sites. (4 pages)

Waste Site	Waste Site Configuration, Construction, and Purpose	Current Waste Site Cover/Vegetation	Site and Discharge History	Rationale
241-U-361 Settling Tank	The 241-U-361 Settling Tank is located southwest of the 221-U Building, north of 16th Street. The 216-U-1 & 216-U-2 Cribs and the 241-U-361 Settling Tank are collocated in a common radiologically controlled area. It is posted with Underground Radioactive Material Area signs. The tank is posted with Inactive Miscellaneous Underground Storage Tank signs. Waste flowed from the 241-U-361 Settling Tank to the 216-U-1 Crib (which lies 30 m [100 ft] to the west), and then to the 216-U-2 Crib. The 241-U-361 Settling Tank is a circular underground settling tank 6 m (20 ft) in diameter by 6 m (19 ft) deep, constructed of 15 cm (6 in.) steel reinforced prestressed concrete. The top of the tank is 2 m (6 ft) below grade and several vents and risers penetrated the ground surface. The surface surrounding the settling tank has been covered with shotcrete.	Gravel and shotcrete	The tank received cell drainage from the 5-6 tank in the 221-U Building and waste from the 224-U Building until the uranium recovery operations shut down in 1957. From July 1957 through May 1967, the 216-U-1 & 216-U-2 Crib system received waste from the 224-U Building and equipment decontamination waste and reclamation waste from the 221-U Building Canyon via the 241-U-361 Settling Tank. In December 1949, the inlet lines to the well were cut and plugged. The waste line was extended from the 241-U-361 Settling Tank to the 216-U-1 and 216-U-2 Cribs. A reverse well was associated with the settling tank; however, the WIDS database indicates that it never received waste. Records show that well 299-W19-9, located adjacent to the 241-U-361 Settling Tank, was completed on August 26, 1944, to a depth of 92 m (302 ft). WIDS states that well 299-W19-9 was abandoned and grouted. Approximately 106,000 liters (28,000 gal) of waste sludge are believed to remain in the tank.	This settling tank is analogous to the 216-U-8 Crib because (1) it received a similar uranium-rich waste stream; (2) it received similar contaminant inventories (less uranium and plutonium, but more Cs-137 and Sr-90); (3) its primary contaminants (Cs-137, uranium, and Sr-90) are similar to those of the 216-U-8 Crib but with the addition of technetium; (4) the two sites have similar hydrogeology and a thick vadose zone; (5) the site is located within close proximity to 216-U-1 and 216-U-2 Cribs (and is connected to them via a stainless steel pipeline) which are considered analogous to 216-U-8 Crib. No characterization data have been collected to specifically characterize any releases from the 241-U-361 Settling Tank. Risks associated with this site are expected to be bounded by the 216-U-8 Crib, because any releases from the tank are expected to be significantly lower in volume than the 216-U-1 & 216-U-2 or 216-U-8 Cribs.

Table B-1. 216-U-8 Crib and Associated Analogous Waste Sites. (4 pages)

Waste Site	Waste Site Configuration, Construction, and Purpose	Current Waste Site Cover/Vegetation	Site and Discharge History	Rationale
200-W-42 VCP / UPR-200-W-163	The release site is located in the soil above the pipeline from the 224-U Building to the 216-U-8 Crib. The release consisted of radiologically contaminated vegetation growing above the site of the 200-W-42 VCP, the underground pipeline to the 216-U-8 Crib. The underground VCP transferred U Plant waste to the 216-U-8 Crib. The area currently is posted with Underground Radioactive Material Area signs. The 15.2 cm (6 in.) diameter VCP runs from a neutralization tank located beneath the 2715-UA Building south to the 216-U-8 Crib. The pipeline is buried 3 to 4 m (10 to 12 ft) below grade. The pipeline was blanked off when the 216-U-8 Crib was deactivated, and it was extended approximately 225 m (738 ft) south to the 216-U-12 Crib. The pipeline is buried approximately 3 m (10 ft) below grade for the segment between the 216-U-8 and 216-U-12 Cribs.	Gravel	UPR-200-W-163 occurred over time, as leaking waste from the underground VCP-contaminated the soil. Vegetation absorbed some of the radioactive contaminants. Broken pieces of contaminated vegetation scattered in the wind and caused the size of the surface-posted contamination area to be increased. The site encompassed 1.8 hectares (4.5 acres) at one time; however 1.4 hectares (3.5 acres) were stabilized and down posted to no posting in 1994. The site currently consists of 0.4 hectare (1 acre) of soil above the underground pipeline that is marked and posted with Underground Radioactive Material Area signs. UPR-200-W-163 is associated with the 200-W-42 VCP connecting the 216-U-8 Crib to the 224-U Building. The posted area over the pipeline on the north side of 16th Street was stabilized in October 2001.	This VCP/unplanned release is considered to be analogous to the 216-U-8 Crib, because the VCP conveyed waste material to the 216-U-8 Crib and therefore is expected to have a similar waste inventory. Surface soil samples collected during the VCP limited field investigation typically showed background levels of activity for analyzed constituents. The highest levels of contamination were detected in the subsurface near the VCP. However, many constituents were distributed throughout the 4 m (12-ft) depth of the investigation. The data also suggested that minor lateral spreading (no more than 1 to 2 m [3 to 5 ft]) was apparent. The maximum concentrations of americium-241, cesium-137, plutonium-239/240, and strontium-90 detected during the pipeline investigation were 426 pCi/g, 49,100 pCi/g, 70.6 pCi/g, and 180 pCi/g, respectively for soils. The highest strontium activity was detected in a vegetation sample at 1,380 pCi/g.

Table B-2. 216-U-12 Crib and Associated Analogous Waste Sites. (6 pages)

Waste Site	Waste Site Configuration, Construction, and Purpose	Current Waste Site Cover/Vegetation	Site and Discharge History	Rationale
Representative Site				
216-U-12 Crib	The 216-U-12 Crib is located in the 200 West Area about 650 m (2,130 ft) south of the 221-U Building and 140 m (460 ft) north of Beloit Avenue. It is south of the 216-U-8 Crib. The 216-U-12 Crib was built in 1960 to replace the 216-U-8 Crib when it showed signs of cave-in potential. It was designed to receive mixed waste (corrosive, D002) from the U Plant via a 15 cm (6 in.) vitrified clay pipeline for approximately 5 minutes every hour, at the rate of 378 L/min (100 gal/min), and to dispose of the process condensate by percolation into the soil column.	Gravel	From April 1960 to May 1967, the site received 291-U-1 Stack drainage, 241-WR Vault waste, and 224-U Building process condensate via the C-5 Tank. Contaminated water from the 241-WR Vault was discharged to the crib in October 1965 that included 3.14 kg (6.9 lb) thorium. From May 1967 to September 1972, the site received the above wastes (excluding the 241-WR Vault waste) plus occasional waste via the C-7 Tank in the 224-U Building. From September 1972 to November 1981, the site was taken out of service. From November 1981 to January 1987, the site received corrosive process condensate (corrosive: [D002] typical pH range is 0.5-1.5) from the 224-U Building. The 216-U-12 Crib was operational until 1988, when the pipeline was cut and capped. The 216-U-12 Crib was replaced by the 216-U-17 Crib. In 1992, the site surface was radiologically surveyed and downposted from a Surface Contamination Area to an Underground Radioactive Material Area.	The 216-U-12 Crib is an inactive crib (gravel filled) that received a significant inventory of contaminants from uranium-rich and acidic process wastes discharged to the crib. Wastewater infiltrated into a thick vadose zone (73 m [239 ft]) via a subsurface drain field. Wastewater volumes (on the order of 151 ML [40 Mgal]) were significant enough to have exceeded the pore volume capacity of the underlying vadose zone and reach groundwater, as evidenced by the presence of tritium and nitrite in the groundwater. Mobile contaminants were carried vertically deep into the vadose zone or to groundwater, but with little lateral spreading. Immobile contaminants were retained in the upper vadose zone with maximum concentrations at the base of the crib (6 m [20 ft] bgs). Primary contaminants are Cs-137, uranium, Sr-90 and nitrate. Limited characterization data are available for the crib, but spectral gamma borehole logging of a borehole through the crib to 53 m [175 ft] bgs indicates Cs-137 from 5 to 18 m (16 to 59 ft) (maximum activity of 16,100 pCi/g at 7 m [23 ft]) and U-238 from 5 to 24 m (17 to 80 ft) (maximum activity of 500 pCi/g at 23 m [76 ft] bgs). Uranium-235 was detected by RLS at 20 pCi/g between 22 m and 24 (73 ft and 80 ft). Levels of Am-241, plutonium, and neptunium-237 are less than 1 pCi/g. Approximately 3.1 kg of thorium also were reported to have been disposed in the crib.

Table B-2. 216-U-12 Crib and Associated Analogous Waste Sites. (6 pages)

Waste Site	Waste Site Configuration, Construction, and Purpose	Current Waste Site Cover/Vegetation	Site and Discharge History	Rationale
Process Waste Group Analogous sites to be evaluated using the 216-U-12 Crib model				
216-U-5 Trench	The site is located northwest of the 221-U Building. The site consists of an unlined trench (12 by 12 m [40 by 40 ft] at base of excavation). The above-ground piping was removed and the trench was backfilled with 3 m (10 ft) of clean soil immediately after receiving waste. No structures exist in the trench, which is posted with Underground Radioactive Material Area signs.	Gravel	This site was used as a liquid disposal site for unirradiated uranium waste from the cold start-up run at the 221-U Building. The site was active only during March 1952. It was deactivated when the start-up waste disposal operation was complete. The aboveground piping was removed and the trench was backfilled. The site was interim stabilized in 1994 with 0.61 m (2 ft) of clean soil.	This trench is considered to be analogous to the 216-U-12 Crib because the site (1) is an inactive unlined trench; (2) received a uranium-rich waste stream; (3) has primary contaminants of uranium and nitrate; (4) is expected to have similar contaminant distributions with maximum concentrations expected at the base of the trench (3 to 6 m [10 to 12 ft] bgs) and little lateral spreading; and (5) has similar hydrogeology and thick vadose zone. This site is bound by the 216-U-12 Crib; however, contaminant concentrations, vertical distribution, and risks likely are lower than those of the crib, based on: (1) the site receiving 2 orders of magnitude less wastewater (2,250,000 L [595,000 gal]); (2) the site receiving a smaller inventory of contaminants (an order of magnitude less uranium, which was unirradiated); (3) the site receiving a single short-duration discharge (lacks a persistent driving source of wastewater), which likely would further limited the vertical movement of contaminants from the point of discharge; and (4) the mobile contaminants (uranium and nitrate) have not impacted the underlying groundwater. Confirmatory sampling should be used to confirm the nature of contamination and the risk associated with this site.

Table B-2. 216-U-12 Crib and Associated Analogous Waste Sites. (6 pages)

Waste Site	Waste Site Configuration, Construction, and Purpose	Current Waste Site Cover/Vegetation	Site and Discharge History	Rationale
216-U-6 Trench	The site is located northwest of the 221-U Building. This site consists of a backfilled trench that is posted Underground Radioactive Material Area. The site consists of an unlined trench (3 by 25 m [10 by 75 ft] at base of excavation). The above- ground piping was removed and the trench was backfilled. No structures exist in the trench.	Gravel	This site was used as a liquid disposal site for unirradiated uranium waste from the cold start-up run at the 221-U Building. The site was active only during March 1952. It was deactivated when the start-up waste disposal operation was complete. In 1994, the crib surface was interim stabilized with 0.46 to 0.61 m (18 to 24 in.) of uncontaminated backfill. An additional contaminated zone, located south of crib, was stabilized at the same time.	This trench is considered to be analogous to the 216-U-12 Crib because the site (1) is an inactive unlined trench; (2) received a uranium-rich waste stream; (3) has primary contaminants of uranium and nitrate; (4) is expected to have similar contaminant distributions with maximum concentrations expected at the base of the trench (3 to 4 m [10 to 12 ft] bgs) and little lateral spreading; and (5) has similar hydrogeology and thick vadose zone. This site is bound by the 216-U-12 Crib; however, contaminant concentrations, vertical distribution, and risks likely are lower than the crib based on: (1) the site receiving 2 orders of magnitude less wastewater (2,250,000 liters [595,000 gal]); (2) the site receiving a smaller inventory of contaminants (an order of magnitude less uranium, which was unirradiated); (3) the site receiving a single short-duration discharge (lacks a persistent driving source of wastewater), which would likely further limited the vertical movement of contaminants from the point of discharge; and (4) the mobile contaminants (uranium and nitrate) have not impacted the underlying groundwater. Confirmatory sampling should be used to confirm the nature of contamination and the risk associated with this site.

Table B-2. 216-U-12 Crib and Associated Analogous Waste Sites. (6 pages)

Waste Site	Waste Site Configuration, Construction, and Purpose	Current Waste Site Cover/Vegetation	Site and Discharge History	Rationale
216-U-15 Trench	The site is located approximately 170 m north of 16th Street and 150 m west of the 271-U Building. The exact location is unknown. The site consists of an unlined trench 6.1 by 6.1 by 4.6 m deep (20 by 20 by 15 ft deep) (PNL-6456). The aboveground piping was removed and the trench was backfilled after the one-time waste water disposal. No structures exist in the trench.	Rabbit brush, tumble weed, and cheat grass.	The site is the result of a deliberate, one-time discharge of liquid waste into a hole in the ground that was immediately backfilled. The waste consisted of 26,500 liters (7,000 gal) of interface crud, activated charcoal, and diatomaceous earth containing approximately 1 Ci of fission products. The site is associated with the 388-U Tank and the 276-U Solvent Storage Tank. No surface markers exist to identify the exact location of this waste unit. Exploratory core samples were taken in 1970 at the point of listed coordinates. No radioactivity was detected (RHO-CD-673).	This trench is considered to be analogous to the 216-U-12 Crib because the site (1) is an inactive unlined trench; (2) received similar types of radionuclides; (3) is expected to have similar radionuclide distributions, with maximum concentrations expected at the base of the trench (5 m [15 ft] bgs) and little lateral spreading; and (4) has similar hydrogeology and a thick vadose zone. This site is bound by the 216-U-12 Crib; however, radionuclide contaminant concentrations, vertical distribution, and risks likely are lower than those of the crib based on: (1) the site receiving several orders of magnitude less wastewater (68,000 liters [18,000 gal]); (2) the site receiving a smaller inventory of radionuclides (3 orders of magnitude less uranium); (3) the site receiving a single short-duration discharge (lacks a persistent driving source of wastewater), which likely would further limited the vertical movement of contaminants from the point of discharge; and (4) mobile contaminants have not impacted the underlying groundwater. The 216-U-12 Crib, however, does not bound the chemical inventory of the 216-U-15 Trench, which received organics including tributyl phosphate and hexone (or paraffin hydrocarbon). No analytical data are available for this site other than a report of core samples taken in 1970, which were not radioactive. There is some uncertainty of the exact location of this site. Confirmatory sampling should be used to confirm the nature of contamination and the risk associated with this site, with a focus on the organics as well as to confirm the site location.

Table B-2. 216-U-12 Crib and Associated Analogous Waste Sites. (6 pages)

Waste Site	Waste Site Configuration, Construction, and Purpose	Current Waste Site Cover/Vegetation	Site and Discharge History	Rationale
216-U-16 Crib	The crib is located south of 16th Street, between Beloit and Cooper Avenues, southwest of the 224-U Building. The crib is identified with concrete markers and is posted with Underground Radioactive Material Area signs. The site is associated with the 388-U Tank and the 276-U Solvent Storage Tank. The site consists of a trench with bottom dimensions of 58 by 80 m (191 by 262 ft). The bottom of the trench is approximately 5 m (17 ft) below grade. The bottom is filled with 1.5 m (5 ft) of gravel that is covered by a 36 mil reinforced polyethylene liner. Above the liner is select backfill to grade. The distribution system for the crib consists of two 8-in. diameter polyvinylchloride header pipes (reducing to 6 in.) set 0.9 m (3 ft) above the trench bottom and running on opposite sides of the crib. The header pipes are connected by a series of 4 in. perforated PVC pipes on 3 m (10 ft) centers that run across the crib. Each header pipe and cross line has a vent pipe. Three gage wells are also shown on plans for the crib--one at each end and in the middle. A 6-in. diameter subdrainage pipe runs the length of the west side of the crib.	Gravel	The crib was built to receive waste from the 224-U Uranium Oxide (UO_3) Processing Facility. Annual surface radiological surveys are performed; no reports of contamination have been located to date. In 1986, monitoring well 299-W19-13 showed elevated levels of uranium and alpha radiation. By 1994, the uranium levels had decreased considerably, but remain greater than the proposed maximum contaminant level. In 1996, the crib was permanently isolated by filling manhole #1 with concrete. In 2000, the vent risers were cut off below grade and the opening was sealed with a polyvinylchloride cap.	This crib is considered to be analogous to the 216-U-12 Crib because: (1) the site is an inactive gravel-filled crib; (2) the site received a uranium-bearing process waste stream; (3) the site received millions of gallons of wastewater (almost 3 times more than the 216-U-12 Crib); (4) the primary radionuclide contaminants (uranium, Cs-137, and Sr-90) are similar; (5) the site is expected to have a similar contaminant distribution with maximum concentrations at the base of the crib (5 m [17 ft] bgs); and (6) the two cribs have a similar hydrogeology and a thick vadose zone. Characterization is limited to geophysical well logs,. The site operated for only 3 years, but received a high enough rate of effluent to create a perched groundwater table. This site is bound by the 216-U-12 Crib; however, contaminant concentrations and risks are likely lower based on: (1) the site receiving a smaller inventory of contaminants (2 orders of magnitude less uranium and 3 orders of magnitude less Sr-90); (2) wastewater was distributed over a much larger crib-base area; and (3) mobile contaminants (e.g., uranium) have not significantly impacted the underlying groundwater with contamination. Confirmatory sampling should be used to confirm the nature of contamination and the risk associated with this site.

Table B-2. 216-U-12 Crib and Associated Analogous Waste Sites. (6 pages)

Waste Site	Waste Site Configuration, Construction, and Purpose	Current Waste Site Cover/Vegetation	Site and Discharge History	Rationale
216-U-17 Crib	The site is located south of 16th Street and east of Beloit Avenue inside the 200 West Area. It is southeast of the 221-U Building. The crib was built to replace the 216-U-16 and 216-U-12 Cribs. The crib is marked and posted with Underground Radioactive Material Area signs. The site consists of a trench with bottom dimensions of 3 by 46 m (10 ft by 150 ft). The trench was approximately 5 m (18 ft) deep with an original sideslope of 1:1.5. A single perforated distribution pipe runs down the centerline of the trench approximately 1.5 m (5 ft) above the trench bottom. The trench was backfilled with 2.0 m (6.5 ft) of clean, coarse gravel. This gravel was covered with a 10 mil polyvinylchloride membrane, which then was covered with approximately 3 m (10 ft) of earth backfill. A 15 cm (6 in.) polyethylene pipeline connects the distribution pipe in the crib to the 224-U Building. Two vent risers on the distribution pipe and three sealed gauge wells are shown on the plans for this crib.	Gravel	The crib received effluent from the 224-U Uranium Trioxide (UO_3) calcining operations. A surface radiological survey in 1997 found no contamination. The vent risers were sealed in 2000 as a preventive measure for potential passive radioactive emission.	The crib is analogous to the 216-U-12 Crib because (1) it is an inactive crib and (2) it was built to replace the 216-U-16 and 216-U-12 Cribs. No characterization data have been collected at the 216-U-17 Crib. Risks associated with this site are expected to be bounded by those of the 216-U-12 Crib because the waste inventory and volume is significantly less than at the 216-U-12 Crib.

- = not detected or not analyzed.
NPH = normal paraffin hydrocarbon.
TBP = tributyl phosphate.

PNL-6456, 1988, *Hazard Ranking System Evaluation of CERCLA Inactive Waste Sites at Hanford*, Vol. 2.
RHO-CD-673, 1979, *Handbook 200 Area Waste Sites*, Volumes I & II.

Table B-3. 216-U-4 Reverse Well/U-4A French Drain and Associated Analogous Waste Sites. (2 pages)

Waste Site	Waste Site Configuration, Construction, and Purpose	Current Waste Site Cover/Vegetation	Site and Discharge History	Rationale
Representative Site				
216-U-4 Reverse Well	This site is located 5.2 m west and 0.6 m north of the 222-U Laboratory. The well is located inside the fence of the UO_3 exclusion area. This site consists of a deactivated reverse well. The site is marked with a small cement cover and a bronze medallion. It is posted as an Underground Radioactive Material Area. The well consists of a 7.6 cm (3 in.) diameter pipe installed 23 m (75 ft) into the ground with the bottom 8 m (25 ft) of pipe perforated. The end of the pipe is nearly closed by flattening. An overflow pipe connects the 216-U-4 Reverse Well with the 216-U-4A French Drain. No stabilization cover exists over the 216-U-4 Reverse Well.	Concrete	The site received acidic decontamination waste containing fission products from the 222-U Laboratory hood sinks. The site began to receive waste in March 1947 and retired when the unit was plugged in July 1955. The site was deactivated by installing an overflow line to the new 216-U-4A French Drain.	Because of the close proximity of the 216-U-4 Reverse Well and 216-U-4A French Drain sites, they have been combined into one conceptual contaminant distribution model. Subsurface soil samples from the limited field investigation showed two distinct areas of contamination. The first is associated with the 216-U-4A French Drain and extends to a depth of 5 m (16 ft). In this zone, americium-241 (200 pCi/g) and cesium-137 (420 pCi/g) are at their maximum concentrations. Between 5 and 11 m (16 and 37 ft) of depth, the activity levels are near or below background. At the 11 m (37 ft) depth, activity levels once again increase, extending to a depth of roughly 30 m (100 ft), with maximum concentrations located at or near the top of the 216-U-4 Reverse Well screening interval (roughly 20 m [60 ft] bgs). Within this zone, the maximum concentrations of americium-241 (190 pCi/g), cesium-137 (1,980 pCi/g), europium-152 (0.6 pCi/g), neptunium-237 (0.85 pCi/g), uranium-234 (5.8 pCi/g), and uranium-238 (7.8 pCi/g) are seen. RLS data show similar contaminant distribution and concentrations to the subsurface soil sampling data. A maximum cesium-137 concentration of 1,460 pCi/g was detected with RLS at 19 m (62 ft).
216-U-4A French Drain	This site is located at the southwest corner of the 222-U Laboratory. The 216-U-4A French Drain was installed 2.4 m north of the 216-U-4 Reverse Well. This site is posted as an Underground Radioactive Material Area. The top of the drain is painted yellow and has a removable lid. The site consists of a 1.3 m (51 in.) diameter concrete pipe placed vertically in the ground. The pipe extends downward a minimum of 1.2 m (4 ft) and its top is 1.5 m (5 ft) below grade. The pipe is not gravel filled and is covered by a 12.7 cm (5 in.) thick wooden lid. The drain rests on undisturbed soil. A 7.6 cm (3 in.) stainless steel pipe runs from the 216-U-4 Reverse Well to the 216-U-4A French Drain a few centimeters below its lid.	Concrete and manhole cover	The site operated from July 1955 to July 1970. From July 1955 to January 1965 the site received acidic decontamination waste containing fission products from hood sinks in the 222-U Laboratory. Waste flowed to the 216-U-4A French Drain via the overflow line from the 216-U-4 Reverse Well. From January 1965 to July 1970 the site received Pacific Northwest Laboratory operations decontamination waste from a hood sink in the 222-U Laboratory. The site has been inactive since Pacific Northwest Laboratory operations in the 222-U Laboratory were shut down.	From the rough bottom of the reverse well at 30 m (100 ft), to the top of the caliche layer (located at roughly 53 m [175 ft] of depth), very little activity above background levels is seen. At the caliche layer, americium-241 (0.8 pCi/g), europium-152 (0.2 pCi/g), uranium-234 (1.8 pCi/g), uranium-235 (0.08 pCi/g), and uranium-238 (1.6 pCi/g) are once again found above background levels.

Table B-3. 216-U-4 Reverse Well/U-4A French Drain and Associated Analogous Waste Sites. (2 pages)

Waste Site	Waste Site Configuration, Construction, and Purpose	Current Waste Site Cover/Vegetation	Site and Discharge History	Rationale
Reverse Well/French Drain Group Analogous sites to be evaluated using the 216-U-4/216-U-4A model				
216-U-4B French Drain	This site is located 9.1 m (30 ft) south of the 222-U Laboratory. The french drain consists of a 0.9 m (36 in.) concrete pipe placed vertically below grade. The pipe extends 3 m (10 ft) downward. The pipe is located under a cement pad with a 2.5 cm (1 in.) diameter steel riser pipe, which has been capped. The vent riser extends approximately 1.2 m (4 ft) above the surface.	Concrete	The french drain is a Washington State-registered underground injection well. It is posted with Underground Radioactive Material Area signs. The site operated from January 1960 to July 1970. The unit was deactivated when Pacific Northwest Laboratory operations in the 222-U Laboratory were shut down. From January 1960 to July 1970, the site received waste from a hot cell and hood in the 222-U Laboratory. From January 1965 to July 1970, the site received waste from hoods and hot cells in the 222-U Laboratory from Pacific Northwest Laboratory work.	This site is analogous to the 216-U-4A French Drain because (1) it is an inactive french drain, (2) the french drain structure depth is similar, (3) waste inventories are similar, and (4) site lithology is similar because of the close proximity of the two sites. The risk associated with the 216-U-4B French Drain is expected to be bounded by the 216-U-4A French Drain because the waste liquid volume discharged to the 216-U-4B French Drain is an order of magnitude less than that discharged to the 216-U-4A French Drain.

-- = not detected or not analyzed.
NPH = normal paraffin hydrocarbon.
TBP = tributyl phosphate.

Table B-4. UPR-200-W-19 Unplanned Release and Associated Analogous Waste Sites. (13 pages)

Waste Site	Waste Site Configuration, Construction, and Purpose	Current Waste Site Cover/Vegetation	Site and Discharge History	Rationale
Representative Site				
UPR-200-W-19	The UPR-200-W-19 site is located north of 16th Street, near the 241-U-361 Settling Tank and the 216-U-1 & 216-U-2 Cribs. In the spring of 1953, organic wastes and cell drainage from the TBP process in the 221-U Building and waste from the 224-U Building (UO_3) overflowed to the ground from the 241-U-361 Settling Tank and the 216-U-1 and 216-U-2 Crib vents. The area where the release occurred is marked as an Underground Radioactive Material Area, which also contains the 216-U-1 Crib, the 216-U-2 Crib, and the 241-U-361 Settling Tank. A portion of the 2607-W5 Septic Tank and Tile Field also is included in the Underground Radioactive Material Area.	Soil, bunch grass, some rabbit brush, tumble weed, and cheat grass	Contamination readings of 11.5 rads per hour at a distance of 7.6 cm (3 in.) were reported over an area of approximately 4.6 m^2 (50 ft^2). In 1953, decontamination was attempted and the area was backfilled, delineated by a wooden fence, and posted with Radiation Zone signs. In 1992, contaminated soil in the vicinity of the 216-U-1 & 216-U-2 Cribs was scraped and consolidated near the 241-U-361 Settling Tank. The surface surrounding the 241-U-361 Settling Tank was surface stabilized with shotcrete. The area was downposted from a Surface Contamination Area to an Underground Radioactive Material Area.	Unplanned release UPR-200-W-19 occurred when organic wastes and cell drainage from the TBP process in the 221-U Building and waste from the 224-U Building (UO3) overflowed to the ground surface from the 241-U-361 Settling Tank and the 216-U-1 and 216-U-2 Crib vents. The current area associated with UPR-200-W-19 is larger than the original release and includes an area overlying the 216-U-1 & 216-U-2 Cribs, the 241-U-361 Settling Tank, and a portion of the 2607-W5 Septic Tank and Tile Field. The shallow subsurface soil samples collected from soil borings 299-W19-96 and 299-W19-97 show a maximum concentration of cesium-137 and strontium-90 of 259 pCi/g and 42 pCi/g, respectively. These soil samples were collected at depths above the discharge depth of the 216-U-1 & 216-U-2 cribs. Surface soil samples in the vicinity of the unplanned release have shown maximum levels of cesium-137 and strontium-90 of 53 pCi/g and 8.4 pCi/g, respectively.

Table B-4. UPR-200-W-19 Unplanned Release and Associated Analogous Waste Sites. (13 pages)

Waste Site	Waste Site Configuration, Construction, and Purpose	Current Waste Site Cover/Vegetation	Site and Discharge History	Rationale
Septic System Group Analogous sites to be evaluated using the UPR-200-W-19 model				
2607-W5 Septic Tank and Tile Field	This unit lies 122 m (400 ft) southwest of the 221-U Canyon Building and east of the 207-U Retention Basin. It is north of the 241-U-361 Settling Tank. The 2607-W5 Septic Tank is a single-compartment tank constructed of concrete and has three entry openings on the top, each protected by a wooden cover. The tank is a buried concrete box that measures 9 m (30 ft) long, 4 m (13 ft) wide, and 3 m (11 ft) deep. Waste enters the tank through an 8-in. diameter VCP. A similar pipe connects the septic tank to a concrete diversion box (measuring 1.5 m [5 ft] long, 1.2 m [4 ft] wide, and 3 m [9 ft] deep), and then to a second concrete diversion box (measuring 2 m [7 ft] long, 1.5 m [5 ft] wide, and 3 m [9 ft] deep) before entering the tile field. The tops of the septic tank and both diversion boxes are located at ground level. The current tile field measures 41 by 30 m (136 by 100 ft). The tile field consists of 41 m (135 ft) lengths of 8-in. diameter perforated pipe spaced 6 m (20 ft) apart. The pipes are underlain by a gravel bed extending 0.6 m (2 ft) below the pipes. The tile field is backfilled 0.76 m (2.5 ft) above the pipes. The surface of the backfill is 0.9 m (3 ft) below the original grade.	Concrete over septic tank, bunch grass on tile field	The 2607-W5 Septic Tank and associated Tile Field are designed to accept sanitary sewer effluent from U Plant facilities. The original design capacity for the system was 292 persons. The septic tank and diversion boxes are currently located in an Underground Radioactive Material Area related to the 216-U-1 & 216-U- 2 Cribs and the 241-U-361 Settling Tank. The tile field is located outside the Underground Radioactive Material Area boundary. Only the south slope of the tile field is inside the boundary. Stabilization actions conducted at the site in 1991 included removing approximately 15 to 30 cm (6 to 12 in.) of soil from the active tile field, consolidating soils southeast of the 241-U-361 Settling Tank, and placement of 46 to 61 cm (18 to 24 in.) of stabilization cover over the area including the 2607-W5 Septic Tank and Diversion Boxes and 216-U-1 & 216-U-2 Cribs. NOTE: MO-107 and MO-419 are located near the 224-U Building (UO_3).	This site is considered analogous to UPR-200-W-19 because (1) the point of discharge within the tile field is shallow compared to that of other waste disposal structures within the U Plant Closure Area, (2) a portion of the site is located within a common radiologically controlled area with UPR-200-W-19, and (3) the site is believed to have low waste inventory contained in the liquid discharged through the tile field, compared to the inventory of other U Plant Closure Area waste sites (cribs, trenches, french drains) designed to receive liquid process wastes. The waste inventory is unknown for this site; however, the risk is expected to be bounded by UPR-200-W-19 because the septic system was not intended for waste disposal other than sanitary effluent. Surface soil samples associated with UPR-200-W-19 are located adjacent to the septic system; however, no characterization data in the tile fields exist for this site. Confirmatory sampling should be used to confirm the nature of contamination and the risk associated with this site.

Table B-4. UPR-200-W-19 Unplanned Release and Associated Analogous Waste Sites. (13 pages)

Waste Site	Waste Site Configuration, Construction, and Purpose	Current Waste Site Cover/Vegetation	Site and Discharge History	Rationale
2607-W5 Septic Tank and Tile Field continued	A second, abandoned, tile field lies immediately west of the current tile field is larger than the current tile field. The 2607-W5 Septic Tank and Tile Fields were scheduled to be abandoned in 2000. Some components of the existing system may have been reused (septic tank, etc.). The old tile field was replaced in 1954. The 2607-W5 Septic Tank and associated Tile Field are designed to accept sanitary sewer effluent from U Plant facilities. In 1998, the system was being used by MO-107 and MO-419. The operational status needs to be verified. For the purposes of this focused feasibility study, it is assumed that these structures will be inactive because of the disposition of the U Plant Canyon Building.			
2607-W7 Septic Tank and Tile Field	This unit lies 14 m (45.9 ft) north of the northernmost corner of the 221-U Canyon Building. The 2607-W7 Septic Tank was a small, 950 L (350 gal) tank constructed of reinforced concrete. The 2607-W7 Septic Tank and associated Tile Field were designed to accept sanitary waste sewer effluent from a single restroom located in the 221-U Canyon Building. It had a design capacity for eight persons. Radioactive materials were handled in the U Plant Canyon Building.	Gravel	This system lies in between two Underground Radioactive Material Areas; however, no radionuclides or hazardous chemicals are known to have been associated with this system. This system was abandoned in 1999. The septic system was abandoned in 1999 per the requirements of WAC 246-272-1851. All septage inside the tank was removed, and the empty tank was filled to eliminate void spaces. Per an agreement with the Washington Department of Health, the septic system lids were left in place. WIDS does not indicate that any stabilization cover has been placed over this site. Previous documentation stated that the 2607-W7 Septic System includes a septic tank and tile field that lie in a radiation zone. A site visit made in 1999 found the septic tank to be located between two Underground Radioactive Material Areas. The location of the drain field was not visually apparent. WIDS indicates that the tile field may be west of the septic tank.	This site is considered analogous to UPR-200-W-19 because (1) the point of discharge in the septic tile field is shallow compared to other waste disposal structures in the U Plant Closure Area and (2) it is believed to have low waste inventory compared to other U Plant Closure Area waste sites (cribs, trenches, french drains) designed to receive liquid process wastes. The waste inventory is unknown for this site; however, the risk is expected to be bounded by UPR-200-W-19 because the septic system was not intended for waste disposal other than sanitary effluent, and the site has been decommissioned in accordance with WAC. No characterization data exist for this site, so confirmatory sampling should be used to confirm the nature of contamination and the risk associated with this site.

Table B-4. UPR-200-W-19 Unplanned Release and Associated Analogous Waste Sites. (13 pages)

Waste Site	Waste Site Configuration, Construction, and Purpose	Current Waste Site Cover/Vegetation	Site and Discharge History	Rationale
Solid Waste Group Analogous sites to be evaluated using the UPR-200-W-19 model				
200-W-56	The site is located approximately 137 m (150 yd) north of the 221-U Building. The site consists of a pile of soil approximately 3.05 m (10 ft) in diameter containing wire, fencing material, metal scrap, cable, and grounding rods.	Rabbit brush, tumble weed, and cheat grass	The site is not marked or radiologically posted.	No known contamination has been documented at this site. The site is considered analogous to UPR-200-W-19 because any releases at this site would have been to surface soils. Any risk associated with this site is expected to be bounded by UPR-200-W-19. No characterization data exist for this site, so confirmatory sampling should be used to confirm the nature of any contamination and the risk associated with this site. The site is also considered analogous to the U Plant Closure Area, Waste Site 200-W-CSLA, which is a rejected site. It is believed that this site may be rejected also.
200-W-57	The laydown area was located outside the fenced T-Hopper Storage Area, on the west side of the 2714-U Building. The site was an excess equipment area for storage for radiologically uncontaminated equipment.	Gravel	A RCRA general inspection in 1997 identified the material as an area needing to be addressed. The equipment was in the process of being salvaged and/or recycled by a junk dealer. The material has been removed and the area now consists of gravel and pavement.	No known contamination has been documented at this site. The site is considered analogous to UPR-200-W-19 because any releases at this site would have been to surface soils. Any risk associated with this site is expected to be bounded by UPR-200-W-19. No characterization data exist for this site, so confirmatory sampling should be used to confirm the nature of any contamination and the risk associated with this site. The site is also considered analogous to the U Plant Closure Area, Waste Site 200-W-CSLA, which is a rejected site. It is believed that this site may be rejected also.

Table B-4. UPR-200-W-19 Unplanned Release and Associated Analogous Waste Sites. (13 pages)

Waste Site	Waste Site Configuration, Construction, and Purpose	Current Waste Site Cover/Vegetation	Site and Discharge History	Rationale
200-W-71	An open trench is visible on a 1948 aerial photograph of the 200 West Area. The trench was located southeast of the 221-U Building, south of 16th Street and east of Beloit Avenue. The trench apparently has been backfilled and is not marked or posted. The 216-U-17 Crib is just west of the trench location. In the 1990s the 200-UP-1 Ground Water Pump and Treat project was located in the area. The trench has been filled in. The date of backfilling is unknown. The area is not posted or marked.	Rabbit brush, tumble weed, and cheat grass	It is not known what the trench was used for. There are no designated burial grounds at this location; however, a drawing (Hanford Drawing H-2-1495, *200 West Steam Line Plot*) shows a maintenance disposal ground (which may be the site formerly known as the 200-W-CSLA site, a rejected site). The 1948 aerial photograph shows an *open* trench and a spoil pile. Historical photos from 1950 and 1956 show smoke emitting from the trench. There are no designated burial grounds at this location. Later, the same area was used as a construction laydown area for the reconfiguration of U Plant for the uranium recovery process. A meeting held in 1987 with several knowledgeable long-time employees attributed the obvious surface debris to the U Plant construction activities. There was a general recollection among the older employees that natural uranium was once sent to a trench in this area. However, no radioactivity was ever detected during various core sampling in the area over the years. Based on the historical photographs and the general lack of information on this site and on UPR-200-W-8, this site may be the burn pit that is described in the UPR-200-W-8 waste site.	Significant uncertainties exist as to the nature of any releases at this site as well as the location of the site. Based on the historical photographs and the general lack of information on this site and on UPR-200-W-8, this site may be the burn pit that is described in the UPR-200-W-8 waste site. See the UPR-200-W-8 rationale below.

Table B-4. UPR-200-W-19 Unplanned Release and Associated Analogous Waste Sites. (13 pages)

Waste Site	Waste Site Configuration, Construction, and Purpose	Current Waste Site Cover/Vegetation	Site and Discharge History	Rationale
UPR-200-W-8	The site is located in the old burning ground, east of the 221-U Building, adjacent to the corner of Beloit and 16th Street.	Soil, some rabbit brush, tumble weed, and cheat grass	Contamination was discovered in the spring of 1950 in the "Old Burning Ground," located east of the U-Plant Facility. Approximately 13.9 m^2 (150 ft^2) were contaminated, with a maximum dose rate of 45 rads/h at 5 cm (2 in.). In 1950, approximately 150 ft^2 of ground were covered with 3 m (10 ft) of clean earth. In an interview conducted with 200 West Area personnel, they remembered the area being cleaned up around 1970 and the area released as a radiation zone. An unspecified amount of soil and debris were removed and transported to another burial ground for disposal. The site is part of the Radiation Area Remedial Action Project.	This unplanned release site is considered analogous to UPR-200-W-19 because the site (1) was originally an unplanned release to surface soils (which was then covered with soil), (2) is believed to have had low liquid waste volumes associated with the release, compared to releases at other U Plant Closure Area waste sites (cribs, trenches, french drains) designed to receive liquid wastes, because it is associated with a burning ground, and (3) is believed to have low waste inventory compared to the inventory at other U Plant Closure Area waste sites (cribs, trenches, french drains) designed to receive liquid wastes. Because the site is an unplanned release, the waste inventory is unknown; however, the risk is expected to be bounded by UPR-200-W-19 because it is believed that contamination was cleaned up at the site. No characterization data exist for this site, so confirmatory sampling should be used to confirm the nature of contamination and the risk associated with this site.

Table B-4. UPR-200-W-19 Unplanned Release and Associated Analogous Waste Sites. (13 pages)

Waste Site	Waste Site Configuration, Construction, and Purpose	Current Waste Site Cover/Vegetation	Site and Discharge History	Rationale
Unplanned Release Group Analogous sites to be evaluated using the UPR-200-W-19 model				
UPR-200-W-118	UPR-200-W-118 was located on the railroad spur northwest of the 221-U Building, adjacent to the 211-U Chemical Tank Farm. The release site consisted of the ground outside the concrete unloading station at the 211-U Tank Farm. The unplanned release site is no longer marked or posted. The contaminated railroad spur was given an unplanned release number in September 1980. A site visit by WIDS indicates that in 1981 the area was posted as a Surface Contamination Area. When radiation surveys in 1982 did not find any significant contamination, the area was released from radiological controls. Although the railcar loading platform was no longer being used, residual contaminated acid in the pump pit and acid lines caused a spread of low-level contamination. The area was posted as a Contamination Area again in the early 1990s.	Gravel	This contaminated area was the result of drips and spills from the reclaimed nitric acid unloading station at the 211-U Chemical Tank Farm. Wind-borne particulate matter spread to the ground surface outside the concrete unloading station, contaminating approximately 0.4 hectare (1 acre) of ground. The Uranium Recovery Process at the 224-U Building received uranyl nitrate from the REDOX and PUREX Plants (S Plant and A Plant, respectively). After the uranium was removed, the reclaimed nitric acid was transferred from the 224-U Building to the 211-UA Building via overhead lines and was stored in the 211-UA tanks. In the 1960s and 1970s, the slightly radio-active nitric acid was recycled back to the REDOX and PUREX Plants. It was pumped out of the 211-UA tanks into railcars via underground lines and a pump pit and was returned to the separations facilities. Some leakage was associated with the pumping process and caused low-level radio-active contamination around the area. The area around the 211-U tanks and railroad spur has been stabilized with gravel and is posted as an Underground Radioactive Material Area.	This unplanned release site is considered analogous to UPR-200-W-19 because the site (1) is an unplanned release to surface soils, (2) is believed to have had low liquid waste volumes associated with the release compared to releases at other U Plant waste sites (cribs, trenches, french drains) designed to receive liquid wastes, (3) is believed to have low waste inventory compared to the inventory at other U Plant waste sites (cribs, trenches, french drains) designed to receive liquid wastes, and (4) is believed to have lateral spreading of contaminants caused by due to wind-blown soil and vegetation. Because the site is an unplanned release, the waste inventory is unknown; however, the risk is expected to be bounded by UPR-200-W-19. No characterization data exist for this site, so confirmatory sampling should be used to confirm the nature of contamination and the risk associated with this site.

Table B-4. UPR-200-W-19 Unplanned Release and Associated Analogous Waste Sites. (13 pages)

Waste Site	Waste Site Configuration, Construction, and Purpose	Current Waste Site Cover/Vegetation	Site and Discharge History	Rationale
Shallow / Surface Waste Site Group Analogous sites to be evaluated using the UPR-200-W-19 model				
UPR-200-W-33	The site is located approximately 27 m (90 ft) east of the 224-U Building. The site is no longer marked or posted. In March 1955, a leaking flange of the C-5 Condensate Line from the 224-U Building caused a small area of the ground to become contaminated.	Gravel and/or asphalt	The release is associated with the Uranium Recovery process at the 224-U Building. The original documentation stated that the ground contamination was "three feet square." This has been interpreted to mean 3 ft on each side. The radiation zone surrounding the contamination measured 10 by 15 ft. In 1955, the top 4 in. of contaminated soil was removed and new soil was used to fill the excavation. The site was removed from radiation zone status in 1970.	This unplanned release site is considered analogous to UPR-200-W-19 because the site (1) is an unplanned release to surface soils, (2) is believed to have had low liquid waste volumes associated with the release compared to releases at other U Plant waste sites (cribs, trenches, french drains) designed to receive liquid wastes, (3) is believed to have low waste inventory compared to inventory at other U Plant waste sites (cribs, trenches, french drains) designed to receive liquid wastes, and (4) is believed to have lateral spreading of contaminants caused by wind-blown soil and vegetation. Because the site is an unplanned release, the waste inventory is unknown; however, the risk is expected to be bounded by UPR-200-W-19. Contamination at this site is believed to be limited to shallow surface soils within the top 0.9 m (3 ft) below ground surface. Confirmatory sampling should be used to confirm the nature of contamination and the risk associated with this site.
UPR-200-W-48	The site is located west of the 221-U Building, at the west end of the 221-U Building railroad cut at Bridgeport Avenue. The site is not posted or marked. On July 8, 1958, the incident occurred when a jumper, wrapped in plastic, was transferred from a flat-bed truck to a railroad flat-car at the railroad crossing. The jumper was transferred to the truck and moved into the 221-U Railroad Tunnel. A survey of the railroad area revealed a spread of contamination in the vicinity of the road intersection with the railroad.	Gravel	The contamination spread was caused by damage to the plastic wrapping during transfer. The area is not currently marked or posted. At the time of the release, dose rates of 9 rad/h were recorded over an area of about 93 m^2 (1000 ft^2). A patch of gravel at the site may be part of the stabilization effort.	This unplanned release site is considered analogous to UPR-200-W-19 because the site (1) is an unplanned release to surface soils, (2) is believed to have had low liquid waste volumes associated with the release because the release was an isolated spill event, and (3) is believed to have low waste inventory because the release was an isolated spill event. Because the site was an unplanned release, the waste inventory is unknown; however, the risk is expected to be bounded by UPR-200-W-19 because the volume of liquid associated with the release is expected to be less than the volume released in UPR-200-W-19. Contamination at this site is believed to be limited to shallow surface soils within the top 0.9 m (3 ft) below ground surface. Confirmatory sampling should be used to confirm the nature of contamination and the risk associated with this site.

Table B-4. UPR-200-W-19 Unplanned Release and Associated Analogous Waste Sites. (13 pages)

Waste Site	Waste Site Configuration, Construction, and Purpose	Current Waste Site Cover/Vegetation	Site and Discharge History	Rationale
UPR-200-W-55	The site is located adjacent to the 224-U Building loading ramp. The site is an unplanned release and is no longer marked or posted.	Unknown	In April 1960, 1.5 tons of uranium powder spilled on the asphalt loading ramp when a loading hose broke. This resulted in contamination of the 224-U Building asphalt loading ramp and a nearby roadway. Following the incident, most of the powder was swept up and recovered, the remainder was washed off the asphalt, and it and soaked into the adjacent ground surface.	This unplanned release site is considered analogous to UPR-200-W-19 because the site (1) is an unplanned release to surface soils, (2) had low liquid waste volumes associated with the release (the remaining uranium powder was washed off of the pavement after cleanup), and (3) is believed to have low waste inventory because the release was an isolated spill event that was promptly cleaned up. Because the site was an unplanned release, the waste inventory is unknown; however, the risk is expected to be bounded by UPR-200-W-19 because the volume of liquid and waste inventory associated with the release is expected to be less than the volume released in UPR-200-W-19, based on the solid nature of the waste that was cleaned up. Confirmatory sampling should be used to confirm the nature of contamination and the risk associated with this site.
200-W-77	The site is located adjacent to the railroad track, west of the 216-U-16 Crib and east of the stabilized 216-U-14 Ditch.	Gravel, some rabbit brush, tumble weed, and cheat grass	The site was submitted to WIDS in 1997 after the area was found to contain blown-in contaminated vegetation that had accumulated along the bank of the railroad track. The area is downwind of the 216-U-14 Ditch, which was being surface stabilized at the time. The 216-U-14 Ditch was a known source for contaminated vegetation at the time. The small contamination area was originally posted as a High Contamination Area. In 2000, soil and vegetation with contamination levels up to 10,000 counts per minute were removed from the area and the area was reposted as a Contamination Area. After the contaminated vegetation was removed, contamination up to 100 counts per second was reported. The site is currently a posted contamination area that *measures* 2 by 5 m (8 by 15 ft) and has been backfilled with gravel.	This unplanned release site is considered analogous to UPR-200-W-19 because the site (1) is an unplanned release to surface soils, (2) is believed to have low waste inventory compared to the inventory at other U Plant waste sites (cribs, trenches, french drains) designed to receive liquid wastes, and (3) is believed to have lateral spreading of contaminants caused by windblown vegetation. Because the site was an unplanned release, the waste inventory is unknown; however, the risk is expected to be bounded by UPR-200-W-19 based on the nature of the release being from windblown vegetation, which was removed. No characterization data exist for this site, so confirmatory sampling should be used to confirm the nature of contamination and the risk associated with this site.

Table B-4. UPR-200-W-19 Unplanned Release and Associated Analogous Waste Sites. (13 pages)

Waste Site	Waste Site Configuration, Construction, and Purpose	Current Waste Site Cover/Vegetation	Site and Discharge History	Rationale
UPR-200-W-78	The site is located approximately 37 m (120 ft) south of the Uranium Trioxide barrel storage area. The site is no longer marked or posted.	Gravel and asphalt	The contamination was first discovered in a radiation survey performed with a truck-mounted monitor in 1970. The equipment detected contamination levels up to 20,000 counts per minute in an area of approximately 3.7 m^2 (40 ft^2). The contamination is presumed to have occurred before 1969, when the last pallets were moved from the 224-U Building. Immediately after the contamination was discovered, an operator was dispatched with a shovel and bucket to pick up the contaminated dirt. No other contamination was found.	This unplanned release site is considered analogous to UPR-200-W-19 because the site (1) is an unplanned release to surface soils, (2) is believed to have low waste inventory compared to the inventory of other U Plant waste sites (cribs, trenches, french drains) designed to receive liquid wastes, and (3) is believed to have lateral spreading of contaminants caused by windblown vegetation. Because the site was an unplanned release, the waste inventory is unknown; however, the risk is expected to be bounded by UPR-200-W-19 based on the nature of the release being from windblown vegetation, which was removed. Contamination at this site is believed to be limited to shallow surface soils within the top 3 ft below ground surface. Confirmatory sampling should be used to confirm the nature of contamination and the risk associated with this site.
200-W-85	The site is located 30 m (100 ft) east of the 2727-WA Sodium Storage Building equipment storage yard.	Gravel and soil	The 6 by 6 m (20 by 20 ft) site was originally posted as a Surface contamination area. The posting surrounded some growing rabbit brush and grass. No soil discoloration or disturbance is apparent. No radiological survey could be found to determine when the area was posted or what the radiological conditions were inside the posted area. In 2001, the area was covered with clean backfill material and downposted to an Underground Radioactive Material Area. The area was covered with clean backfill to an unknown thickness.	This unplanned release site is considered analogous to UPR-200-W-19 because the site (1) is an unplanned release to surface soils and (2) is believed to have low waste inventory compared to the inventory at other U Plant waste sites (cribs, trenches, french drains) designed to receive liquid wastes. Because the site was an unplanned release, the waste inventory is unknown; however, the risk is expected to be bounded by UPR-200-W-19 based on the nature of the release being from windblown vegetation, which was removed. Contamination at this site is believed to be limited to shallow surface soils within the top 0.9 m (3 ft) below ground surface. No characterization data exist for this site, so confirmatory sampling should be used to confirm the nature of contamination and the risk associated with this site.

Table B-4. UPR-200-W-19 Unplanned Release and Associated Analogous Waste Sites. (13 pages)

Waste Site	Waste Site Configuration, Construction, and Purpose	Current Waste Site Cover/Vegetation	Site and Discharge History	Rationale
200-W-87	The site is located adjacent to the railroad track, 61 m (200 ft) northwest of the 2714-U Building and T-Hopper yard on the U Plant chemical spur railroad track west of the 216-U-16 Crib and east of the stabilized 216-U-14 Ditch.	Gravel and soil	The site was originally a posted Contamination Area on a portion of the railroad spur. The site was discovered and submitted to WIDS as a discovery site in 2000. At that time, no radiological survey could be located to explain why the area was posted or what the radiological conditions were inside the posted area. Research performed by WIDS indicates that originally the site may have been posted because of the presence of a potentially contaminated train on the siding from 1996 to 1998. Tests on the train indicated that it had no smearable contamination. In 1998, the train was removed and the Contamination Area posting may have remained in place. The area was covered with clean backfill and downposted to an Underground Radioactive Material Area in 2001. The site was covered with clean backfill to an unknown depth.	This unplanned release site is considered analogous to UPR-200-W-19 because the site may have been an unplanned release to surface soils. Because the site was an unplanned release, the waste inventory is unknown; however, the risk is expected to be bounded by UPR-200-W-19 based on the uncertainty that any waste was released at the site. If any contamination exists at this site, it is believed to be limited to shallow surface soils within the top 0.9 m (3 ft) below ground surface. No characterization data exist for this site, so confirmatory sampling should be used to confirm the nature of contamination and the risk associated with this site.
200-W-89	The site is located near the intersection of Beloit Avenue and 16th Street in the 200 West Area, east of the 224-U Building. The site is a posted Underground Radioactive Material Area where the 252-U Electrical Substation had been located. A large electrical transformer, surrounded with radioactive material signs, is located near the center of the Underground Radioactive Material Area. All aboveground structures, with the exception of one transformer, were demolished and disposed of.	Gravel	The 252-U Electrical Substation was decommissioned and demolished in 1998. The large transformer was left in place because it was too costly to move. The area was stabilized with gravel in 1999 and posted as an Underground Radioactive Material Area. Before decommissioning, readings of 5,000 d/min beta/gamma and 3,500 d/min alpha were reported for equipment associated with the substation. After decommission, maximum readings of 700 counts per minute were reported for the remaining gear and the soil. It is believed that the site became contaminated over time from emissions from the 291-U Stack. No polychlorinated biphenyls were identified at the site. The area was stabilized with gravel to an unknown depth in 1999.	This unplanned release site is considered analogous to UPR-200-W-19 because the site (1) is an unplanned release to surface soils and (2) is believed to have low waste inventory. Because the site was an unplanned release, the waste inventory is unknown; however, the risk is expected to be bounded by UPR-200-W-19 because no liquid waste disposal associated with the release has been identified, and much of the contaminated equipment associated with the site was removed. Contamination at this site is believed to be limited to shallow surface soils around the foundation within the top 0.9 m (3 ft) below ground surface. No characterization data exist for this site, so confirmatory sampling should be used to confirm the nature of contamination and the risk associated with this site.

Table B-4. UPR-200-W-19 Unplanned Release and Associated Analogous Waste Sites. (13 pages)

Waste Site	Waste Site Configuration, Construction, and Purpose	Current Waste Site Cover/Vegetation	Site and Discharge History	Rationale
UPR-200-W-117	The release site was the ground around the railroad cut northwest of the 221-U Building.	Gravel	In 2000, a posted Surface contamination area was located on the railroad spur leading to the 221-U railroad cut and tunnel. Most of the posted area is railroad track on a bed of gravel. There is an unusual patch of asphalt across a portion of the railroad track, inside the posted Surface contamination area. The original unplanned release had been posted with Surface Contamination signs in 1980. This was released from posting in 1983. Later the area extending from the tunnel door to a point 55 m (180 ft) down the track was posted as a Contamination Area. The source of the contamination is believed to be liquid and particulate matter that dropped from railroad cars moving equipment in and out of the 221-U Building over time. In 2001, the site was graded and covered with 0.3 m (1 ft) of clean gravel and downposted to an Underground Radioactive Material Area.	This unplanned release site is considered analogous to UPR-200-W-19 because the site (1) is an unplanned release to surface soils, (2) is believed to have had low liquid waste volumes associated with the release compared to the volumes at other U Plant waste sites (cribs, trenches, french drains) designed to receive liquid wastes, (3) is believed to have low waste inventory compared to the inventory of other U Plant waste sites (cribs, trenches, french drains) designed to receive liquid wastes, and (4) is believed to have lateral spreading of contaminants caused by windblown soil and vegetation in the railroad cut. Because the site was an unplanned release, the waste inventory is unknown; however, the risk is expected to be bounded by UPR-200-W-19 because it is expected that the liquid waste volume caused by intermittent drips and spills is expected to be less than the volume released at UPR-200-W-19. Contamination at this site is believed to be limited to shallow surface soils within the top 0.9 m (3 ft) below ground surface. No characterization data exist for this site, so confirmatory sampling should be used to confirm the nature of contamination and the risk associated with this site.
UPR-200-W-60	Spotty contamination extended from the 221-U Tunnel door along the railroad tracks for a distance of 69 m (225 ft). This unplanned release is located in the UPR-200-W-117 unplanned release site.	Gravel	In 1966, contaminated water dripped from a hole in the bottom of a purex equipment transfer box as the box was being pulled from the 221-U Building tunnel. Radioactivity along the tracks ranged from a few thousand counts per minute up to 1 rad/h. In 1966, the contamination was isolated and cleaned. This site is contiguous with a later unplanned release (UPR-200-W-117). The site was backfilled with gravel to a depth of 0.3 m (1 ft) as part of the remediation of UPR-200-W-117 in 2001.	This site is associated with UPR-200-W-117; see description above.

Table B-4. UPR-200-W-19 Unplanned Release and Associated Analogous Waste Sites. (13 pages)

Waste Site	Waste Site Configuration, Construction, and Purpose	Current Waste Site Cover/Vegetation	Site and Discharge History	Rationale

- = not detected or not analyzed.
NPH = normal paraffin hydrocarbon.
PUREX = Plutonium-Reducation Extraction (Plant).
REDOX = Reduction-Oxidation (Plant).
TBP = tributyl phosphate.
WAC = *Washington Administrative Code.*

Hanford Drawing H-2-1495, *200 West Steam Line Plot*
Resource Conservation and Recovery Act of 1976, 42 U.S.C. 6901, et seq.
WAC 246-272, "On-Site Sewage Systems," *Washington Administrative Code.*
Waste Information Data System, Hanford Site database.

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APPENDIX C

REPRESENTATIVE SITE RISKS

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Table C-1. Waste Site Risk Summary. (3 Pages)

Risk Element	216-U-8 Crib	216-U-12 Crib	216-U-4 Reverse Well / 216-U-4A French Drain	UPR-200-W-19	216-U-1 and 216-U-2 Cribs	200-W-42 VCP and UPR-200-W-163
Does the Site meet Human Health PRGs - Chemicals?						
Do concentrations Exceed WAC 173-340 Method C?	No	No	No	No	No	No
Does the Site meet Human Health PRGs - Radionuclides? Assumes that No Credit is Taken for the Protectiveness of the Existing Cover.						
Dose at 0 years (mrem/yr)	262	NA	108	163	157	24300
Radionuclides that contribute dose, 0 years	Cesium-137	NA	Cesium-137	Cesium-137	Cesium-137	Cesium-137
Dose at 50 years (mrem/yr)	82.8	NA	37.1	51.5	49.6	7670
Radionuclides that contribute dose, 50 years	Cesium-137	NA	Cesium-137	Cesium-137	Cesium-137	Cesium-137
Dose at 150 years (mrem/yr)	8.44	NA	7.5	5.19	4.99	783
Radionuclides that contribute dose, 150 years	Cesium-137	NA	Cesium-137 Thorium-232 Americium-241 Radium-226	Cesium-137	Cesium-137	Cesium-137
Years to reach 15 mrem	141	NA	125	129	128	804
Does the Site meet Human Health PRGs -Radionuclides? Assumes that the Existing Cover Provides Some Protection.						
Dose at 0 years (mrem/yr)	6.81E-02	NA	NA	9.41E-03	2.15E-03	6.36
Radionuclides that contribute dose, 0 years	Cesium-137	NA	NA	Cesium-137	Cesium-137	Cesium-137
Dose at 50 years (mrem/yr)	5.39E-02	NA	NA	7.44E-03	1.7-E-03	5.04
Radionuclides that contribute dose, 50 years	Cesium-137	NA	NA	Cesium-137	Cesium-137	Cesium-137
Dose at 150 years (mrem/yr)	3.42E-02	NA	NA	4.68E-03	1.07E-03	3.23
Radionuclides that contribute dose, 150 years	Cesium-137	NA	NA	Cesium-137	Cesium-137	Cesium-137
Years to reach 15 mrem	0	0	0	0	0	0
Does the Site meet Groundwater Protection PRGs - Chemicals?						
Are groundwater protection standards exceeded based on initial screening?	Yes	Yes	Yes	No	Yes	Yes

Table C-1. Waste Site Risk Summary. (3 Pages)

Risk Element	216-U-8 Crib	216-U-12 Crib	216-U-4 Reverse Well / 216-U-4A French Drain	UPR-200-W-19	216-U-1 and 216-U-2 Cribs	200-W-42 VCP and UPR-200-W-163
Contaminants modeled based on initial screen	Nitrate N as Nitrate & Nitrite Uranium	N as Nitrate & Nitrite Uranium	Uranium	None	Uranium	N as Nitrate & Nitrite Uranium
Vadose zone modeling results	N as Nitrate and Nitrite peaks at > 1000 years Uranium peaks at > 1000 years Nitrate does not exceed the PRG.	N as Nitrate and Nitrite peaks at year 2061 Uranium does not exceed PRG.	Uranium peaks at > 1000 years.	NA	Uranium peaks at > 1000 years	N as Nitrate and Nitrite does not exceed PRG. Uranium does not exceed PRG.
Contaminant depth at maximum concentration	60.4 m (198 ft)	64.2 m (210 ft)	NA	NA	NA	NA
Years to exceed standard	N as Nitrate and Nitrite = 116 Uranium > 1000	N as Nitrate and Nitrite = 15	Uranium > 1000	NA	Uranium > 1000	NA
Years to achieve goal	N as Nitrate and Nitrite= 896 Uranium > 1000	N as Nitrate and Nitrite = 818	Uranium > 1000	NA	Uranium > 1000	NA
Groundwater protection required?	Yes (N as Nitrate and Nitrite)	Yes (N as Niitrate and Nitrite)	No	No	No	NA
Does the Site meet Groundwater Protection PRGs - Radionuclides?						
Are groundwater protection standards exceeded based on initial screening?	Yes	No	No	No	Yes	No
Contaminants modeled based on initial screen	Technetium-99	None	None	None	Technetium-99 Uranium-235 Uranium-238	None
Vadose zone modeling results	Technetium-99 peaks at year 2797	None	None	None	Technetium-99 peaks at year 2492 Uranium-235 and -238 peaks at > 1000 years	None
Contaminant depth at maximum concentration	0.6 m (2 ft)	NA	NA	NA	m (ft)	NA
Years to exceed standard	Technetium-99 = 630	NA	NA	NA	Technetium-99 = 254 Uranium-235 > 1000 years Uranium-238 > 1000 years	NA

Table C-1. Waste Site Risk Summary. (3 Pages)

Risk Element	216-U-8 Crib	216-U-12 Crib	216-U-4 Reverse Well / 216-U-4A French Drain	UPR-200-W-19	216-U-1 and 216-U-2 Cribs	200-W-42 VCP and UPR-200-W-163
Years to achieve goal	Technetium > 1000				Technetium-99 = 730 Uranium-235 > 1000 Uranium-238 > 1000	
Groundwater protection required?	Yes (Technetium-99)	No	No	No	Yes (Technetium-99)	No
Does the Site meet Ecological PRGs - Chemicals?						
Do concentrations exceed ecological PRGs?	No	Yes	No	No	No	Yes
Constituents that exceed PRGs	NA	Arsenic Barium	NA	NA	NA	Arsenic
Ecological protection required?	NA	No Risk attributed to background levels, see Appendix C	NA	NA	NA	No Risk attributed to background levels, see Appendix C
Does the Site meet Ecological PRGS - Radionuclides?						
Do concentrations exceed ecological PRGs?	Yes	No	No	Yes	Yes	Yes
Constituents that exceed PRGs	Cesium-137	NA	NA	Cesium-137	Cesium-137	Cesium-137
Ecological protection required?	No Exclusion basis provided in Appendix C	NA	NA	No Exclusion basis provided in Appendix C	No Exclusion basis provided in Appendix C	Yes

Note - This table presents a summary of the constituents identified as primary risk contributors in Appendix C and the constituents identified as a potential groundwater protection concern as discussed in Appendix D.

WAC 173-340, "Model Toxics Control Act - Cleanup."

HI = hazard index.
HQ = hazard quotient.
NA = not applicable.
PRG = preliminary remediation goal.

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APPENDIX D

APPLICATION OF ALTERNATIVES TO THE WASTE SITES

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Table D-1. Application of Alternatives to Waste Sites. (2 pages)

Waste Site	Alternative 1 - No Action	Alternative 2 - Maintain Existing Soil Cover, Institutional Controls and Monitored Natural Attenuation	Alternative 3 - Remove and Dispose	Alternative 4 - Capping
REPRESENTATIVE SITE				
216-U-8 Crib			X	X
Process Waste Group analogous wastes sites to be evaluated by the 216-U-8 Crib model				
216-U-1 and 216-U-2 Cribs			X	X
241-U-361 Settling Tank		X	X	X
200-W-42 Vitrified Clay Pipeline and UPR-200-W-163 unplanned release			X	X
REPRESENTATIVE SITE				
216-U-12 Crib			X	X
Process Waste Group analogous wastes sites to be evaluated by the 216-U-12 Crib model				
216-U-5 Trench		X	X	X
216-U-6 Trench		X	X	X
216-U-15 Trench		X	X	X
216-U-16 Crib		X	X	X
216-U-17 Crib		X	X	X
REPRESENTATIVE SITE				
216-U-4 Reverse Well and 216-U-4A French Drain		X	X	X
Reverse Well/French Drain Group analogous wastes sites to be evaluated by the 216-U-4 Reverse Well and 216-U-4A French Drain model				
216-U-4B French Drain		X	X	X
REPRESENTATIVE SITE				
UPR-200-W-19 unplanned release		X	X	X
Septic System Group analogous wastes sites to be evaluated by the UPR-200-W-19 model				
2607-W5 Septic System		X	X	X
2607-W7 Septic System	X	X	X	X

Table D-1. Application of Alternatives to Waste Sites. (2 pages)

Waste Site	Alternative 1 - No Action	Alternative 2 - Maintain Existing Soil Cover, Institutional Controls and Monitored Natural Attenuation	Alternative 3 - Remove and Dispose	Alternative 4 - Capping
Solid Waste Group analogous wastes sites to be evaluated by the UPR-200-W-19 model				
200-W-56 Dump	X	X	X	X
200-W-57 Dump	X	X	X	X
200-W-71 Pit		X	X	X
UPR-200-W-8 Burial Ground	X	X	X	X
Unplanned Release Group analogous wastes sites to be evaluated by the UPR-200-W-19 model				
UPR-200-W-118 unplanned release		X	X	X
Shallow / Surface Waste Site Group analogous wastes sites to be evaluated by the UPR-200-W-19 model				
UPR-200-W-33 unplanned release	X	X	X	X
UPR-200-W-48 unplanned release	X	X	X	X
UPR-200-W-55 unplanned release	X	X	X	X
200-W-77 unplanned release	X	X	X	X
UPR-200-W-78 unplanned release	X	X	X	X
200-W-85 unplanned release	X	X	X	X
200-W-87 unplanned release	X	X	X	X
200-W-89 Foundation	X	X	X	X
UPR-200-W-117 unplanned release	X	X	X	X
UPR-200-W-60 unplanned release	To be remediated with UPR-200-W-117			

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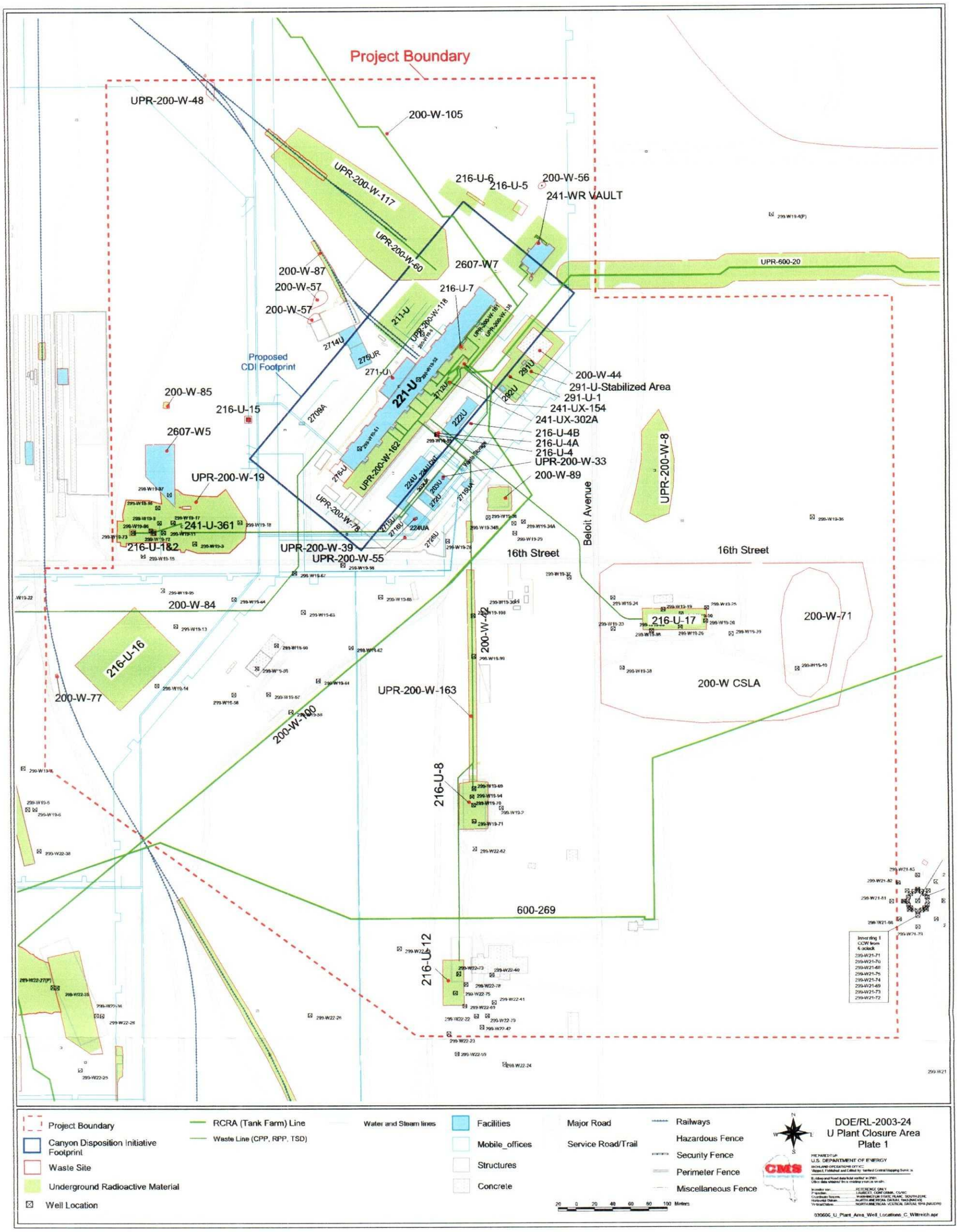
Project Boundary
UPR-200-W-48
200-W-105
UPR-200-W-117
UPR-200-W-60
216-U-6
216-U-5
200-W-56
241-WR VAULT
2607-W7
UPR-600-20
200-W-87
200-W-57
200-W-57
216-U-7
211-U
UPR-200-W-118
UPR-200-W-161
UPR-200-W-136
2714U
275UR
271-U
Proposed
CDI Footprint
221-U
UPR-200-W-162
200-W-44
291-U-Stabilized Area
291-U-1
241-UX-154
241-UX-302A
216-U-4B
216-U-4A
216-U-4
UPR-200-W-33
200-W-89
200-W-85
216-U-15
2709A
2607-W5
UPR-200-W-19
241-U-361
216-U-1&2
UPR-200-W-39
UPR-200-W-55
UPR-200-W-78
UPR-200-W-8
Beloit Avenue
16th Street
16th Street
200-W-84
216-U-16
200-W-77
200-W-100
UPR-200-W-163
200-W-42
216-U-17
200-W-71
200-W CSLA
216-U-8
600-269
216-U-12
Project Boundary
Canyon Disposition Initiative Footprint
Waste Site
Underground Radioactive Material
Well Location
RCRA (Tank Farm) Line
Waste Line (CPP, RPP, TSD)
Water and Steam lines
Facilities
Mobile_offices
Structures
Concrete
Major Road
Service Road/Trail
Railways
Hazardous Fence
Security Fence
Perimeter Fence
Miscellaneous Fence
20 0 20 40 60 80 100 Meters
DOE/RL-2003-24
U Plant Closure Area
Plate 1
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030606_U_Plant_Area_Well_Locations_C_Wittreich.apr